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HUMAN FACTORS ENGINEERING

BIBLIOGRAPHIC SERIES

VOLUME 3

1965 LITERATURE

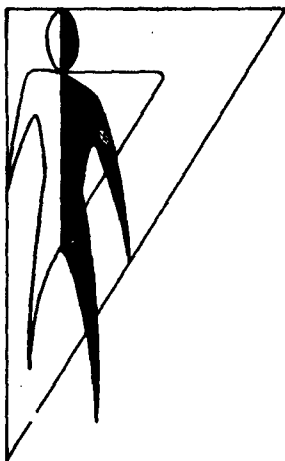
Prepared by

THE PROJECT STAFF  
DEPARTMENT OF DEFENSE  
HUMAN FACTORS ENGINEERING INFORMATION ANALYSIS CENTER

Institute for Psychological Research  
Tufts University

MAY 1967

HUMAN ENGINEERING LABORATORIES



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Prepared by

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and

THE PROJECT STAFF

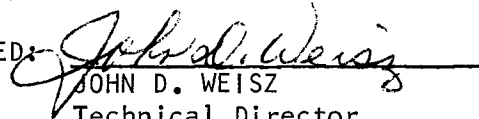
DEPARTMENT OF DEFENSE

HUMAN FACTORS ENGINEERING INFORMATION ANALYSIS CENTER

Institute for Psychological Research  
Tufts University

May 1967

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## FOREWORD

The Department of the Army was assigned responsibility, effective 1 October 1965, for the development and maintenance of a Human Factors Engineering Information Analysis Center in accordance with the provisions of the Department of Defense Scientific and Technical Information program (DoD Instruction 5100.45). At present the Information Analysis Center is located at Tufts University under the technical guidance of the U. S. Army Human Engineering Laboratories.

The Office of Naval Research initiated the Tufts University effort over ten years ago. This volume, and the two preceding it, covering the human factors engineering literature from 1940 through 1965, although published by the U. S. Army Human Engineering Laboratories, is a result of the Office of Naval Research support and direction of this program during its formative years.

Robert F. Chaillet  
Technical Specifications Office  
U. S. Army Human Engineering  
Laboratories

## Table of Contents

Introduction . . . . .	Page 1
Instruction in the Use of the Present Bibliography . . . . .	
Key to Abbreviations . . . . .	

Part I . . . .	Index to the Human Factors Engineering Literature. .1 - 1
----------------	---

Part II. . . .	Facsimile of Subject Matter File . . . . . II - 1
----------------	---

Part III . . .	Citations and Abstracts
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## Introduction

This document is the third in a series of bibliographies covering the human factors engineering literature. The first volume, HEL BIB VOL I, covered the 1940 through 1959 literature. The second bibliography contained material, for the most part, from the time period 1960 through 1964. This volume deals with the 1965 literature.

As in the past the project staff was influenced by several considerations in the selection of references for inclusion in the bibliography. First, there was an attempt to select those references which reflected the broad spectrum of revealed interests of human factors personnel. Second, the documents had to be available to the project staff for examination prior to coding and abstracting. If the document was not among the acquisitions of the project, it was not included in the bibliography.

Because of the tremendous volume of literature published during this period, the project staff was not able to acquire every document of relevance. The present volume should, however, provide a useful compilation of references to the human factors engineering literature along with the previous volumes which reflect the cumulative (through 1965) acquisitions of the HEIAS.

This and future volumes will be published in punched loose leaf page format, thus permitting additions of new material and modifications of old. Additions will be in the form of new acquisitions. Modifications will be primarily in the form of changes to the index and the resulting changes in the coding of the accessions involved. At some later date it is planned to publish a complete set of those pages that have been or will have been modified. Also at some later date an author index which is now in preparation will be published. It is suggested that the user place the present volume in a notebook (or notebooks) or whatever form he finds convenient for use and future modifications.

## Instruction in the Use of the Present Bibliography

### General

The user should examine the index (Part I) thoroughly before attempting to locate references on a specific topic. Familiarization with the terms is essential if effective retrieval is to be realized. After examining its content, the user should be able to enter the index with the terms which are descriptive of, or synonymous with his query. Documents have been coded only to those terms or descriptors which are underlined. Having noted the terms of interest he should then go to Part II (Facsimile of Subject Matter File) and under the appropriate terms find the accession numbers of those documents which have been coded to that term. Noting these numbers he can then go to Part III (Citations and Abstracts) to find the actual references.

### Index Changes

There have been some slight modifications in the index published in the first two volumes of this series. These changes are reflected in the present index. However, no major changes have been made and the user should have no trouble going from the index in Volume II to the present one. As mentioned previously, it is hoped that in the near future an updated and cumulative Part I and II can be published.

### The Index and Its Use

The accessions are only coded to those terms which are underlined and in the cases of subheading, are coded to the lowest subcategory (i.e., to the secondary or tertiary heading, if there is one). For example, if the reader will note the category Aging, Effects of, he will find a number of secondary categories, such as vision; motor performance; etc. No references have been coded to Aging, Effects of, as such, but only to the secondary

headings. In the case of Radar and other CRT Displays the reader will note the secondary heading screen and under this, various tertiary headings, such as size and shape. Relevant documents, for example those dealing with the shape of radar screens or scope faces, have been coded to the lowest subcategory, in this case size and shape. No references will have been coded to screen alone.

The index can, of course, be used as a hierarchical system or a coordinate index. For example, if a user were interested in articles dealing with drugs and their effects, he would examine the references listed in the category Drugs. Similarly, if he were interested in articles dealing with man's tolerance to acceleration, he would go the category Motion, Effects of/acceleration and deceleration/tolerance. However, if he were interested in the effects of drugs on man's tolerance to acceleration forces, rather than go through all the references in the above mentioned categories, the reader should note only those accession numbers common to both categories. The loose leaf notebook form should facilitate this type of matching.

The reader is advised to look through the various general categories in making a search. These categories contain not only references of a general nature, books, bibliographies, etc., but in some cases miscellaneous articles which could not be readily coded elsewhere. Occasionally, the reader will note a secondary heading "other". These categories contain references to equipment, methods, topics, etc., not specifically listed under the main heading.

An index of this nature develops through use. All relevant terms and descriptors cannot be anticipated in its initial development and are often incorporated only after the index has been in use for some time. Therefore, if the user cannot find terms specifically descriptive of his problem he

should attempt to find synonymous terms. As mentioned previously, the user should examine the whole index thoroughly before attempting to locate specific topics.

### Facsimile of Subject Matter File

Part II contains those categories to which documents have been coded along with the accession numbers of the documents. In essence, it represents the index stripped to the bare essentials, i.e., minus all cross headings and notes. The user will note that there are several categories with only a few or no references coded to them. These categories were left in the index because it is known that in the later bibliographies, there will be a number of references coded to them.

### Citations and Abstracts

Part III contains the actual citations and abstracts listed in numerical order by accession number. This section was compiled by filming the actual 5x8 citation and abstract cards from the files of the HEIAS.

The format of the citations is generally in keeping with the recommendations of the Publication Manual of the American Psychological Association. In some instances, however, variation in the amount and type of information in the original document has introduced some variation in the final citation. The content of the citation tries to maximize the amount of information to assist the user in acquiring a copy of the document.

The letter code R found at the end of the abstract refers to the number of references found in the articles (e.g., R-7 means that 7 references were cited). A list of abbreviations used in the abstracts is given on the next page.

The documents cited are not available from Tufts University, but are held in repository at the HEIAS and may be examined on the project's premises.



# KEY TO ABBREVIATIONS

a.c.	alternating current	g	acceleration of normal pull of gravity
AD	average deviation	G	gravitational force acting upon an object
AFGCT	Armed Forces General Classification Test	GCA	Ground Control Approach
AGCT	Army General Classification Test	GSR	galvanic skin response
AIAA	American Institute of Aeronautics & Astronautics		
AL	adaptation level	Hg	mercury
amp.	ampere	hr.	hour
ANIP	Army-Navy Instrument Program	i	intensity
ANOVA	analysis of variance	IBM	International Business Machine
AP	action potentials	i.e.	that is
AR	acoustic reflex	ILS	Instrument Landing System
AVID	Advanced Visual Information Display	in.	inch
		IQ	Intelligence Quotient
bit	unit of information		
BMR	basal metabolic rate	j.n.d.	just noticeable difference
C	centigrade	kc	kilocycle
ca	about or approximately	kg	kilogram
cc	cubic centimeter	KR	knowledge of results
CCC	Combat Control Center		
cff	critical flicker frequency	L	lambert
CIC	Combat Information Center	LL	loudness level
clo	measure of protective value of fabrics	lb	pound
cm	centimeter		
CNS	central nervous system	m	meter
CO	carbon monoxide	M	mean
CO <sub>2</sub>	carbon dioxide	Ma	milliampere
cpm	cycles per minute	Mc	megacycle
cps	cycles per second	Mdn	median
CR	critical ratio	mg	milligram
CRT	cathode ray tube	mi	mile
cu ft	cubic foot	min.	minute
		mL	millilambert
db	decibel	mm	millimeter
d.c.	direct current	MOS	Military Occupational Specialty
df	degrees of freedom	mph	miles per hour
DL	difference limen	msec	millisecond
		μm	millimicron
E, Es.	experimenter, experimenters	μsec.	microsecond
EEG	electroencephalogram		
e.g.	for example	N	number of
EKG or ECG	electrocardiogram	°	degree
EMG	electromyogram	O, Os.	observer, observers
ERG	electroretinogram	O <sub>2</sub>	oxygen
et al	and others	OCS	Officers' Candidates School
etc.	and so forth	OR	Operations Research
Exp.	experiment		
		p	probability level
f	frequency	PB	phonetically balanced
F	fahrenheit, F-ratio	PERT	Program Evaluation and Review Technique
ft	foot	PGR	psychogalvanic skin response
ft-c	foot-candle	PI	photo interpretation
ft-L	foot-Lambert	PPI	Planned Position Indicator
ft-lbs	foot-pounds		
ft/sec	feet per second		

KEY TO ABBREVIATIONS (Cont'd)

pps pulses per second  
psi pounds square inch  
PSS Personnel Subsystem concept (USAF)  
PED Personnel and Equipment Data file  
HE verifying Human Engineering Design Standards  
QQPRI Qualitative and Quantitative Personnel Requirements Information  
PSTE Personnel Subsystem Test and Evaluation  
TC Training concepts  
TED Training Equipment Development program  
TEPI Training Equipment Planning Information  
TOTM Technical Orders and Manuals  
TP Training Plans

r roentgen, correlation coefficient  
rad absorbed dose of radiation  
REM Roentgen equivalent in man  
RBE relative biological effectiveness  
ROTC Reserve Officers Training Corps  
rpm revolutions per minute  
RT reaction time

S, Ss subject, subjects  
SAGE Semi Automatic Ground Environment  
SD standard deviation  
SDT signal detection theory  
sec. second  
S/N signal-to-noise ratio  
SPL sound pressure level  
S-R stimulus-response  
SUBIC Submarine Integrated Control

t t-test  
TTS temporary threshold shift  
vs versus  
VTOL Vertical Takeoff and Landing Aircraft

SYMBOLS:

$\chi^2$  chi square  
% per cent  
> more than  
< less than  
= equal  
 $\Delta I$  change in intensity  
 $\mu$  micron  
 $\sigma^2$  variance

A

- Ability Testing--see Tests and Testing (proficiency)
- Absolute Judgments--see Psychophysics; specific sensory categories
- Absolute Pitch--see Audition (stimulus characteristics)
- Acceleration and Deceleration--see Motion, Effects of
- Acceptability of Equipment and Tasks--see Individual Factors Affecting Performance
- Accessibility--see Maintenance (design for); Work Place Design (area requirements)
- Accidents--see Safety
- Acclimatization--see Environmental Conditions and Effects (tolerance, adaptation, acclimatization); Physiological Capacities and Indices
- Accommodation and Convergence--see Visual
- Accuracy of Movement--see Motor Performance and Skills (speed and precision)
- Acoustic
  - design--see also Ambient Noise (reduction and control); Work Place Design (acoustics)
  - engineering--see design, above
  - measurement--see Ambient Noise (measurement)
  - reflex--see Audition (aftereffects of stimulation)
  - shielding--see Ambient Noise (reduction and control)
- Action Potential--for data, see Physiological Capacities and Indices; for methods, see Physiological Equipment and Methods
- Activity Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems
- Acuity
  - auditory--see Audition (thresholds)
  - sensory, other--see specific sensory categories
  - visual--see Visual
- Adaptation
  - auditory--see Audition (aftereffects of stimulation)
  - perceptual--see Perception (general)
  - theory--see Perception (theory)
  - visual--see Visual (adaptation, pre-adaptation, and pre-exposure)
- Adaptive Systems--see also Artificial Intelligence; Controls (automatic)
- Adjustment, Method of--see Psychophysics (methods)
- Aerial Observations--see Visual (search and detection)
- Aerospace Medicine, general--see Environmental Conditions and Effects (general); Space Travel
- A-Frames--see Packs and Carriers
- Afterimages--see Audition (aftereffects of stimulation); Visual (aftereffects, afterimages)
- Aging, Effects of
  - audition
  - general
  - intellectual performance--see work capacity, below
  - motor performance
  - vision
  - work capacity
- Aiding--see Tracking
- Aiming--see Motor Performance and Skills
- Airblast--see Environmental Conditions and Effects (windblast, airblast, windchill)
- Airborne Equipment--see Aircraft (related equipment)
- Air Conditioning--see Work Place Design (atmospheric control)
- Aircraft
  - accidents--see Safety
  - collision--see Safety
  - communication systems--see Speech (communication systems)
  - controls--see Controls
  - design--see also Helicopters; VTOL, STOL Aircraft
  - escape from--see Escape from

Aircraft (cont'd)

general

instrument panel arrangement--see Panel and Console Design

landing and landing systems

lighting, exterior

lighting, interior--see Work Place Design (illumination)

noise--see Ambient Noise (level)

related equipment

visibility and recognition--see Visual (search and detection)

Air Crews--see Groups

Air Defense--see Command and Control Systems; Surveillance Systems

Airport (airfields)

facilities--see also Air Traffic Control Systems

lighting--see Lighting Systems (outdoors)

noise--see Ambient Noise (level)

runway design--see Aircraft (landing and landing systems)

Air Reconnaissance--see Visual (search and detection)

Air Sickness--see Motion, Effects of

Airspeed Indicators--see Displays (type)

Air Traffic Control Systems

communication and information flow--see also Language Design; Speech (communication systems)

control problems

equipment (displays, etc.)

general

layout and workplace design

operator variables

traffic flow

training and simulation

Alarms and Auditory Warning Devices--see Auditory (displays, nonverbal)

Alcohol--see Drugs

Alertness--see Individual Factors Affecting Performance

Allocation of Functions--see Assignment of Functions to Men and Machines in Systems

Alphanumeric Displays--see Displays (type); Radar and other CRT Displays (types)

Altimeters--see Displays (type)

Altitude Chamber--see Environmental Conditions and Effects (equipment and methods)

Altitude, Effects of--see Environmental Conditions and Effects

Ambient Noise

accidents--see effects on performance, below

composition--see measurement, below

control--see reduction and control, below

criteria for buildings--see Acoustic (design); reduction and control, below;  
Work Place Design (acoustics)

deafness--see hearing loss, below

effects on performance (includes industrial efficiency)

general

hearing loss--see also Audition (aftereffects of stimulation)

injury--see hearing loss, above

level

aircraft

airport

equipment, general

industrial environments

office, home, and general background

rockets, missiles, and launch facilities

ships and submarines

Ambient Noise

level (cont'd)

vehicle (motor)

weapons

measurement (e.g., spectral analysis, critical band analysis)

reduction and control--see also Acoustic (design); Work Place Design (acoustics)

acoustic shielding

general

hearing conservation program

noise reducing devices and systems

personal equipment (e.g., earplugs)--see Auditory (devices)

standards of tolerance and annoyance

speech interference level--see Speech (masking)

tolerable level--see reduction and control, above

Amplifiers--see Auditory (equipment)

Anchoring Effects--see Perception (general); Psychophysics

Anechoic Chambers--see Audition (equipment and methods)

Angle, Perception of--see Visual (perception)

Ankle Dimensions--see Anthropometric Measures

Anomalies

auditory--see Audition

sensory, other--see specific sensory categories

visual--see Visual

Anoxia--see Environmental Conditions and Effects (oxygen requirements)

Anthropometric Measures

arm and leg dimensions

biomechanical analysis

body density and centers of gravity

body size and dimensions

equipment and methods

extent and flexibility of limb movement

general

hand and foot dimensions

head dimensions

locomotion

muscular strength and endurance

posture

somatotyping

space requirements--see also Work Place Design (area requirements)

Anti-g-Suits--see Clothing (high altitude and anti-g)

Anxiety--see Individual Factors Affecting Performance (emotion)

Anxiety, Tests of--see Tests and Testing (personality and sociometric)

Apparent Movement--see Visual (perception)

Aptitude--see Individual Factors Affecting Performance

Aptitude Testing--see Tests and Testing

Aqua Lung--see Underwater (breathing apparatus)

Arctic Climate Clothing--see Clothing (Arctic ensembles and cold weather)

Arm

dimensions--see Anthropometric Measures

movement--see Anthropometric Measures; Motor Performance and Skills

strength--see Anthropometric Measures (muscular strength and endurance)

Armored Vehicle--see Vehicle

Armored Vests--see Clothing (body armor)

Articulation Testing--see Communications Systems (techniques for evaluation); Speech

Artificial Intelligence (biosimulation)

Artificial Limbs--see Prosthetics  
Asbestos Suits--see Clothing (thermal protection)  
Aspiration, Level of--see Individual Factors Affecting Performance (motivation and morale)  
Assignment of Functions to Men and Machines in Systems  
Assignment of Personnel--see Personnel  
Atmosphere--see Environmental Conditions and Effects  
Attention--see Individual Factors Affecting Performance (set and attention); Perception;  
Training (basic learning data); Vigilance and Monitoring  
Attenuators--see Auditory (equipment)  
Attitude Indicators--see Displays (type)  
Attitude Toward Task--see Individual Factors Affecting Performance (acceptability of and  
attitude toward equipment and tasks)  
Audiogyric Effects--see Orientation in Space, Factors Determining; Perception (illusions)  
Audiometry--see Audition (equipment and methods); Speech  
Audio-Visual Aids--see Training Aids and Devices  
Audio-Visual Interaction--see Sensory (interaction)  
Audio-Visual Monitoring--see Vigilance and Monitoring (performance)  
Audio-Warning Devices--see Auditory (displays, nonverbal); Warning Devices

#### Audition

aftereffects of stimulation (e.g., acoustic reflex, fatigue, pitch shifts, time errors, etc.)

aging--see Aging, Effects of; norms, below

anomalies and individual differences

auditory patterns and meaning (e.g., flutter discrimination, melodic and temporal)

binaural vs. monaural

equipment and methods (e.g., anechoic chambers, audiometric devices, communication  
simulators, techniques of audiometry)

general

norms

physiological mechanisms

psychophysical scales (e.g., mel scale, sone scale)

recruitment

repetitive stimulation

sound localization

standards and specifications

stimulus characteristics

frequency and pitch

intensity and loudness

other (e.g., brightness, duration, timbre, vocality)

stimulus mixtures (e.g., harmonics, beats, combination tones, modulations)

thresholds

training, nonverbal--see Training (specific types)

#### Auditory

acuity--see Audition (thresholds)

adaptation--see Audition (aftereffects of stimulation)

detection--see skills, below

devices

ear defenders (e.g., plugs, pads, etc.)

enhancement devices (e.g., hearing aids, guidance for blind, etc.)

displays, nonverbal--for systems utilizing verbal communication, see Speech  
(communication systems)

flight guidance systems (flybar)

intermittent warning and signaling devices (e.g., sirens, bells, radio range)

multi-channel

sonar and other underwater sound systems

telegraphic systems

Auditory (cont'd)

equipment

input devices (e.g., microphones, vibration pickups)

output devices (e.g., earphones, loudspeakers)

transmission devices (e.g., amplifiers, attenuators, frequency modulators, scramblers)

fatigue--see Audition (aftereffects of stimulation)

feedback--see signals, below

flight guidance systems--see displays, above

localization--see Audition (sound localization)

masking--for speech masking, see Speech

noise--see Ambient Noise

numerousness--see signals, below

patterns--see Audition

reaction time--see Reaction Time and Refractory Period

search--see skills, below

signals

channel capacity

coding

detection--see skills, below

feedback

general characteristics

to-noise ratio

skills

discrimination

monitoring

search and detection

sonar listening--see monitoring, above

tracking--see Tracking

training--see Training (specific types)

vs. visual presentation--see Sensory (comparison)

Aural Harmonics--see Audition (stimulus mixtures)

Aural Reading Devices--see Auditory (devices)

Auto-Correlation Function--see Mathematical and Statistical Methods

Autoinstruction--see Programmed Instruction; Training Aids and Devices (teaching machines)

Autokinetic Effects--see Visual (perception)

Automatic

checkout systems--see Maintenance (systems)

control systems--see Controls

learning devices--see Training Aids and Devices (teaching machines)

maintenance--see Maintenance (systems)

Automation

Automobile Accidents--see Safety

Automobile Design--see Vehicle

Automobiles--see Vehicle

Aviation Medicine--see Environmental Conditions and Effects (general)

B

Backlighting--see Instrument Lighting (rear)

Back Rests--see Seats and Seating (body supports)

Ballistic Vests--see Clothing (body armor)

Band Compression Speech--see Speech (distortion)

Barometric Pressure--see Environmental Conditions and Effects

Basic Training--see Training (specific types)

Beacon Lights--see Warning and Signal Lights  
 Bearing Information Aids--see Radar and other CRT Displays (range and bearing scales and aids)  
 Beats--see Audition (stimulus mixtures)  
 Bells--see Auditory (displays, nonverbal)  
Belts, Harnesses, and other Restraining Devices--see also Clothing (belts and fasteners)  
 Bends--see Environmental Conditions and Effects (decompression)  
 Betting Behavior--see Subjective Probability  
 Bibliographies--see General and Comprehensive References in Human Factors Engineering;  
     bibliographies also are included under general in major topics  
 Binaural Discrimination--see Audition (binaural vs. monaural)  
 Binocular Disparity--see Visual (perception)  
 Binocular Field--see Visual (field)  
 Binoculars--see Optical Aids  
Biodynamics--see also Anthropometric Measures; Motor Performance and Skills  
 Bioelectric Methods and Equipment--see Physiological Equipment and Methods  
 Bio-instrumentation--see Physiological Equipment and Methods  
 Bio-kinetic Analysis--see Anthropometric Measures; Motor Performance and Skills  
 Biomechanical Analysis--see Anthropometric Measures; Motor Performance and Skills  
Bionics  
 Biosimulation--see Artificial Intelligence  
 Bisectioning Movements--see Motor Performance and Skills  
 Black Light--see Light (special types)  
 Blackout--see Motion, Effects of (acceleration and deceleration)  
 Blindness--see Visual (anomalies and individual differences)  
 Blindness, Flash--see Flash  
 Blinking--see Motor Performance and Skills (involuntary reflexes)  
 Blinking Signal Lights--see Flash (rate); Traffic (signs and signals); Warning and Signal Lights  
 Blink Rate--see Flash; Motor Performance and Skills (involuntary reflexes)  
 Body  
     armor--see Clothing  
     build--see Anthropometric Measures  
     density--see Anthropometric Measures  
     movement, perception of--see Perception  
     size and dimensions--see Anthropometric Measures  
     supports--see Belts, Harnesses, and other Restraining Devices  
     temperature--see Physiological Capacities and Indices  
 Bone Conduction--see Audition (physiological mechanisms)  
 Books in Human Factors Engineering--see General and Comprehensive References in Human Factors Engineering  
 Boredom--see Individual Factors Affecting Performance (motivation and morale)  
 Braille Systems--see Tactile Coding  
 Breathing Capacity--see Physiological Capacities and Indices  
Breathing Devices and Equipment--see also Masks; Underwater  
 Brightness  
     comfort relation--see Visual (comfort and fatigue)  
     discrimination--see Visual  
     sky--see Light (natural)  
 Broad Band Blue Illumination--see Light (special types)  
 Buffeting--see Vibration (whole body)

# C

Cabs, Truck--see Vehicle  
 Caffeine, Effects of--see Drugs  
 Caloric Intake--see Diet, Food, and Nutrition



Calorimetry--see Physiological Equipment and Methods (metabolic measurement)

Camouflage and Concealment

Canal Sickness--see Motion, Effects of (sickness)

Cardio-vascular Indices--see Physiological Capacities and Indices

Cards, Design of (e.g., data processing cards, E-Z Sort, etc.)

Cargo Handling Systems--see Supply Systems

Carrier Approach Light Systems--see Aircraft (landing and landing systems); Lighting Systems (outdoors)

Carriers--see Packs and Carriers

Cathode-Ray-Tube Displays--see Radar and other CRT Displays

Centers of Gravity--see Anthropometric Measures

Centrifuge--see Motion, Effects of (equipment and methods)

Channel Capacity--see Auditory (signals); Sensory (comparison); Visual (information processing)

Characters and Symbols, Design of--see Numerals, Letters, and Characters, Design of

Charts, Design of--see Maps and Charts, Design of

Check Lists--see Job Performance Aids

Chest Measurement--see Anthropometric Measures (body size and dimensions)

Choice Behavior--see Individual Factors Affecting Performance (thought processes)

Chopping--see Speech (distortion)

Chronophotography--see Motor Performance and Skills (equipment and methods)

Cinematography--see Films; Training Aids and Devices

Click-Pitch Threshold--see Audition (stimulus characteristics); Auditory (signals)

Climatic Chamber--see Environmental Conditions and Effects (equipment and methods)

Clipping--see Speech (distortion)

Closed Ecological Systems--see Space Flight Systems (sealed cabins)

Clothing

Arctic ensembles and cold weather

belts and fasteners

body armor

equipment and methods

fabrics

flight

footgear

general

handgear

headgear

high altitude and anti-g

noxious agents, protection (e.g., rocket fuel, liquid oxygen, etc.)

radiation protection

restrictive effects

sizing, techniques of measurement

space suits

    tests of--see equipment and methods, above

thermal protection

tropical ensembles

    underwater ensembles--see Underwater

Cochlear Response--see Audition (physiological mechanisms)

Cockpit Lighting--see Work Place Design (illumination)

Cockpits--see Aircraft (design)

Coding

    auditory signals--see Auditory (signals)

    color--see Color

    controls--see Controls

    kinesthetic--see Kinesthesia

    lights--see Light

    tactile--see Tactile Coding

    visual--see Visual

Cognitive Processes--see Individual Factors Affecting Performance (thought processes)  
 Cold Environments--see Environmental Conditions and Effects  
 Cold Weather Protective Clothing--see Clothing (Arctic ensembles and cold weather)  
 Collision, Mid-Air--see Safety  
Color--see also Vision (color vision)  
     coding--see also Light; Visual  
         filters--see Optical Aids; Vision (equipment and methods)  
         lights--see Light  
         paints and finishes--see Paints, Finishes, and Surfaces  
         phenomena--see Vision (color vision)  
         preference--see Vision (color vision)  
         smokes--see Signaling Systems, Visual  
         systems (e.g., abridged systems, international XYZ system, etc.)--see Visual  
             (standards and specifications)  
 Colorimetry--see Vision (equipment and methods)  
 Combat Information Centers, CIC--see Command and Control Systems  
 Combination Tones--see Audition (stimulus mixtures)  
Comfort--see also Seats and Seating; Visual (comfort and fatigue)  
Command and Control Systems  
Communication and Information Theory  
     general  
         information assessment and processing  
         redundancy, uncertainty  
Communication Systems  
     general  
         group--see Groups  
         nonverbal--see Auditory (displays, nonverbal); Tactile Coding  
         speech--see Speech  
         techniques for evaluation  
 Comparison of Sensory Channels--see Sensory (comparisons)  
 Compatibility, Stimulus-Response--see Control-Display Dynamics; Sensory (general)  
 Compensatory Tracking--see Tracking  
 Complexity of Work or Task--see Work and Task Performance  
 Complex Tones--see Audition (stimulus mixtures)  
 Compression and Expansion, Speech--see Speech (distortion)  
Computers  
     data processing systems  
     design  
     general  
     man interaction  
     models and programs  
     simulation--see also Simulation and Simulators  
     systems component  
 Concept Formation--see Individual Factors Affecting Performance (thought processes);  
     Training (basic learning data)  
 Confinement--see Prolonged Confinement  
 Console Design--see Panel and Console Design  
 Contact Analog Displays--see Displays (type)  
Containers and Packaging  
 Contaminated Environments--see Environmental Conditions and Effects  
Control-Display Dynamics  
     compatibility and motion stereotypes  
     feedback--see Tracking  
     general  
     integration  
     movement ratios  
     quickening--see also Tracking

Controller, Human--see Human

Controls

adjustments--see setting, precision, below

aided--see Tracking

aircraft

automatic

backlash, deadspace, and response lag

coding

combined (e.g., pushbutton on stick, ganged controls)

comparison of types

eye (as control mechanism)

force and time to activate

general

handgrips and handles

industrial (e.g., on machinery or equipment)

labeling--see Labels, Design of

linear movement

levers and sticks

pedals and rudder bars

push buttons and toggle switches

loading--see resistance, below

location and positioning

multiple-axis

remote handling

resistance (damping, inertia, friction, torque, etc.)

rotary movement

cranks and wheels

knobs

sensitivity and amplification--see Control-Display Dynamics (movement ratios)

setting, precision

ship and submarine controls--see Ship and Submarine

spacecraft--see Space Flight Systems

three-axis--see multiple-axis, above

vehicle controls (e.g., automobiles, tanks, etc.)--see Vehicle

Control Tower

design of workspace--see Air Traffic Control Systems

language--see Language Design

speech--see Speech (communication systems)

systems--see Air Traffic Control Systems

Convergence (of eyes)--see Visual (accommodation and convergence)

Correlation Techniques--see Mathematical and Statistical Methods

Cost Effectiveness Analysis--see Systems Design (techniques of analysis)

Counters--see Displays (type)

Crane Cabs--see Controls (industrial); Industrial (equipment, design of)

Cranking Movement--see Motor Performance & Skills (repetitive movements)

Cranks--see Controls (rotary movement)

Crash Impact and Survival--see Safety

Creativity--see Individual Factors Affecting Performance (thought processes)

Crews--see Groups

Critical

band analysis--see Ambient Noise (measurement); Speech (basic characteristics)

flicker frequency--see Flicker

incident technique--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Cross Modality Matching--see Psychophysics (methods); Sensory (interaction)

CRT Displays--see Radar and other CRT Displays

Cursors--see Radar and other CRT Displays (range and bearing scales and aids)  
Cushions--see Seats and Seating  
Cutaneous Communication Systems--see Tactile Coding  
Cutaneous Sense--see Touch  
Cybernetics

D

Damping--see Ambient Noise (reduction and control); Controls (resistance)  
Dark Adaptation--see Visual (adaptation, pre-adaptation, and pre-exposure)  
Data  
    analysis--see Mathematical and Statistical Methods  
    processing systems--see Computers  
Daylight--see Light (natural)  
Dazzle--see Flash (blindness); Visual (comfort and fatigue)  
Deafness--see Ambient Noise (hearing loss)  
Deceleration--see Motion, Effects of (acceleration and deceleration)  
Decision Analysis--see Game and Decision Theory; Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems  
Decision Making--see Command and Control Systems; Individual Factors Affecting Performance (thought processes)  
Decision Theory--see Game and Decision Theory  
Decompression Sickness--see Environmental Conditions and Effects (decompression)  
Depth Perception--see Visual (perception)  
Desert--see Clothing; Environmental Conditions and Effects (hot)  
Detection, Auditory--see Auditory (skills)  
Detection Theory--see also Psychophysics  
Detection, Visual--see Visual (search and detection)  
Dial and Scale Design--see Displays  
Dial Setting--see Motor Performance and Skills (positioning movements)  
Diet, Food, and Nutrition  
Difference and Summation Tones--see Audition (stimulus mixtures)  
Digital Displays--see Displays (type)  
Dimensions  
    body--see Anthropometric Measures  
    furniture--see Furniture Design  
    work place--see Work Place Design  
Discriminability Scaling--see Psychophysics  
Disorientation--see Orientation in Space, Factors Determining  
Display-Control Dynamics--see Control-Display Dynamics  
Displays  
    auditory--see Auditory (displays, nonverbal)  
    dial and scale design  
    general  
    location--see Panel and Console Design  
    pointer design  
    quickened--see Control-Display Dynamics; Tracking  
    reading and interpretation problems  
    size and shape  
    type  
        airspeed indicators  
        altimeters  
        attitude indicators  
        combined displays (integrated)  
        comparison of types (e.g., outside-in vs. inside-out)  
        heading indicators  
        indicator and warning--see also Warning Devices  
        integrated displays--see combined displays, above

## Displays

### type (cont'd)

large displays (for viewing by more than one person, e.g., plot boards)

other (e.g., digital, kinalog, matrix, etc.)

polar coordinate

radar--see Radar and other CRT Displays

television--see Television

Distance Perception--see Visual (perception)

Distorted Vision--see Visual (field)

## Diurnal Cycles

Door Handles--see Controls

Doors and Doorways--see Work Place Design (passageways)

Doppler Displays--see Auditory (displays, nonverbal)

## Driving

### analysis of

performance and skills

safety--see Safety

## Drugs

### Dummy and Mannikin Design

Dye Markers--see Signaling Systems, Visual

Dynamic Acuity--see Visual (acuity)

## E

### Ear

damage--see Ambient Noise (hearing loss)

defenders--see Auditory (devices)

muffs--see Auditory (devices)

plugs--see Auditory (devices)

protectors--see Auditory (devices)

EEG--see Physiological Capacities and Indices; Physiological Equipment and Methods (electrophysiological techniques)

Ego-Involvement--see Individual Factors Affecting Performance (motivation and morale)

Ejection Capsule--see also Escape from; Seats and Seating

Ejection Seats--see Escape from; Seats and Seating (ejection)

Elastic Resistance--see Controls (resistance)

Electrocardiogram--see Physiological Capacities and Indices; Physiological Equipment and Methods (electrophysiological techniques)

Electroencephalogram--see Physiological Capacities and Indices; Physiological Equipment and Methods (electrophysiological techniques)

Electroluminescence--see Instrument Lighting

Electromyograph--see Physiological Equipment and Methods (electrophysiological techniques)

Electronic Equipment--see Equipment (design and evaluation)

Electroretinogram--see Physiological Equipment and Methods (electrophysiological techniques); Vision (physiological mechanisms)

Emergency Lights--see Warning and Signal Lights

Emotion--see Individual Factors Affecting Performance

Empty Field Myopia--see Vision (effects of unusual environments)

Energy Expenditure--see Physiological Capacities and Indices

Engine Mufflers--see Ambient Noise (reduction and control)

Engine Noise--see Ambient Noise

Entrances--see Work Place Design (passageways)

Environmental Conditions and Effects--see also Stress

acclimatization--see tolerance, below

air conditioning--see Work Place Design (atmospheric control)

air velocity

atmospheric pressure (high altitude)

#### Environmental Conditions and Effects (cont'd)

climatic chamber--see equipment and methods, below

cold

decompression

equipment and methods

evaporative cooling

general

heating

hot (includes both desert and tropical environments)

humidity

ionized air

oxygen requirements

radiation

space--see Space Travel

temperature (room)

thermal radiation

tolerance, adaptation, acclimatization

altitude and pressure

cold

heat

weightlessness--see Space Travel; Weightlessness

toxic environments

ventilation

water--see also Underwater

windblast, airblast, windchill

#### Equipment

arrangement--see Work Place Design

design and evaluation (includes equipment not covered elsewhere, e.g., electronic equipment)

noise--see Ambient Noise

#### Equipment Used in Human Factors Research

Ergonomics--see General and Comprehensive References in Human Factors Engineering

#### Error

analysis--see Mathematical and Statistical Methods

equipment--see also Maintenance

human

#### Escape from

aircraft and spacecraft--see also Ejection Capsules; Seats and Seating (ejection)

other places

submarines--see Ship and Submarine

#### Exercise and Performance--see also Physical Fitness and Performance

Exits and Entrances--see Work Place Design (passageways)

Experimental Method--see Research Techniques in Human Factors Engineering

Explosive Decompression--see Environmental Conditions and Effects (decompression)

#### Eye

as Control Mechanism--see Controls

blink--see Motor Performance and Skills (involuntary reflexes)

dominance

fixation--see Panel and Console Design (spatial dynamics, frequency of use of components, and order of use); Printed Material, Legibility, and Readability

movement

#### F

Face Masks--see Masks

Face-to-Face Communication--see Speech (communication systems)

Facial Measurements--see Anthropometric Measures

Facilitation of Reception--see Sensory (interaction)

Facilities (Human Engineering)

Factor Analysis--see Mathematical and Statistical Methods

Factory Lighting--see Work Place Design (illumination)

Fallout, Radioactive--see Environmental Conditions and Effects (radiation)

Fatigue--see Auditory (aftereffects of stimulation); Exercise and Performance; Sleep and Performance; Visual (comfort and fatigue); Work and Task Performance

Fear--see Individual Factors Affecting Performance (emotion)

Feedback

delayed auditory--see Auditory (signals)

delayed speech--see Speech (distortion)

sensory feedback--see Sensory (feedback)

theory--see Cybernetics

tracking--see Tracking (feedback)

training--see Training (basic)

Field of View, Work Place--see Work Place Design (visibility, field of view)

Figural Aftereffects--see Visual (aftereffects, afterimages); Kinesthesia

Films

display use

general, human factors--see General and Comprehensive References in Human Factors Engineering

research, use in--see Research Techniques in Human Factors Engineering

training--see Training Aids and Devices

Filters

auditory--see Auditory (equipment)

optical--see Optical Aids; Vision (equipment and methods)

Fire Fighting

clothing--see Clothing (thermal protection)

equipment--see also Vehicle

Fitness, Physical--see Physical Fitness and Performance

Fixtures, Lighting--see Work Place Design (illumination)

Flares--see Lighting Systems (outdoors); Signaling Systems, Visual; Warning and Signal Lights

Flash

blindness

rate--see also Repetitive Stimulation (visual)

visibility--see also Warning and Signal Lights

Flesch Reading Ease Formulas--see Printed Material, Legibility, and Readability

Flexibility of Movement--see Anthropometric Measures

Flicker

Flight

control systems--see Controls

guidance systems

performance and skills--see also Low Level, High Speed Flight

safety--see Safety (air)

simulation (includes spaceflight)

testing

training--see Training (specific types)

Floodlights--see Lighting Systems (outdoors)

Flow Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems; Work Place Design

Fluorescent and Luminous Materials

Flybar--see Auditory (displays, nonverbal)

Fog, Haze, Smog, and Smoke

Food--see Diet, Food, and Nutrition

Foot

dimensions--see Anthropometric Measures

gear--see Clothing

Form Perception--see Visual (perception)

Free Fall--see Motion, Effects of (acceleration and deceleration)

Frequency

distortion--see Speech (distortion)

modulators--see Auditory (equipment)

Frictional Resistance--see Controls (resistance)  
Frostbite--see Environmental Conditions and Effects (cold)  
Function Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations,  
and Systems  
Furniture Design--see also Seats and Seating

## G

G Forces--see Motion, Effects of (acceleration and deceleration)  
Gain--see Control-Display Dynamics (movement ratios)  
Galvanic Skin Response--see Physiological Capacities and Indices  
Galvanometer--see Physiological Equipment and Methods (other methods and equipment)  
Game and Decision Theory  
Gases--see Environmental Conditions and Effects  
Gas Masks--see Masks

### General and Comprehensive References in Human Factors Engineering

#### articles and reports

#### bibliographies

#### books

#### films

#### handbooks

#### symposia and conferences

Glare--see Flash (blindness); Visual (comfort and fatigue)  
Glasses--see Optical Aids  
Gloves--see Clothing (handgear)  
Goggles--see Optical Aids  
Graphs and Tables, Design of  
Gravitational Forces--see Motion, Effects of (acceleration and deceleration)  
Gravity, Centers of--see Anthropometric Measures  
Grenades--see Weapons Systems, Design of (handheld)  
Grips--see Controls  
Grip Strength--see Anthropometric Measures (muscular strength)  
Ground Support Equipment--see also Space Flight Systems; Weapons Systems, Design of  
Grouping of Components--see Panel and Console Design (layout)

### Groups

#### air crews

#### communication

#### evaluation

#### general

#### infantry squads

#### interaction

#### leadership

#### missile crews

#### morale

#### performance

#### research techniques

#### selection

#### ship and submarine crews

#### size and structure

#### space crews

#### tank crews

#### theory

#### training--see Training

Gunnery Training--see Training (specific types)

Gustation--see Smell and Taste

Gust scale--see Smell and Taste



## H

Habitability--see Prolonged Confinement; Ship and Submarine; Space Flight Systems (sealed cabins)

### Hand

dimensions--see Anthropometric Measures

grips--see Controls

signals--see Signaling Systems, Visual

strength--see Anthropometric Measures

tools, design of--see Tools, Design of

wheels--see Controls (rotary movement)

Handbooks--see General and Comprehensive References in Human Factors Engineering

Handbooks, Manuals, Texts, Design of

Handedness--see Motor Performance and Skills

Hand Grenades--see Weapons Systems, Design of (handheld)

Handgear--see Clothing

Handles--see Controls

Harnesses--see Belts, Harnesses, and other Restraining Devices

Hats--see Clothing (headgear)

Headphones--see Auditory (equipment)

Head Size--see Anthropometric Measures

### Hearing

aids--see Auditory (devices)

conservation program--see Ambient Noise (reduction and control)

loss--see Ambient Noise; Audition (anomalies and individual differences); Speech (audiometric testing)

Heart Rate--see Physiological Capacities and Indices

Heat--see Environmental Conditions and Effects

Heated Suits--see Clothing (thermal protection)

Heating--see Environmental Conditions and Effects

Heat Loss--see Physiological Capacities and Indices (temperature, body)

### Helicopters

Helmets--see Clothing (headgear)

High Altitude--see Environmental Conditions and Effects (atmospheric pressure)

Highway Lighting--see Lighting Systems (outdoors)

Highway Research--see also Safety (motor vehicle and highway); Traffic

Hot Weather Clothing--see Clothing (tropical ensembles)

Hot Weather Environments--see Environmental Conditions and Effects

Houses, Dwellings, and Shelters, Design of

Hue--see Vision (color vision)

### Human

controller (general discussion of man as a control mechanism)

error--see Error

information processing capabilities (includes reception and transmission)

transfer functions

Human Factors Engineering--see General and Comprehensive References in Human Factors Engineering

Humidity--see Environmental Conditions and Effects

Hyperopia--see Visual (anomalies and individual differences)

Hypodynamics--see Sensory (deprivation); Weightlessness

Hypoxia--see Environmental Conditions and Effects (oxygen requirements)

## I

ICAO Phonetic Alphabet--see Language Design

Ideal Observer--see Detection Theory; Psychophysics (theory)

Illumination--see Instrument Lighting; Light; Lighting Systems; Vision; Visual; Work Place Design

Illusions, Perceptual--see Perception (illusions)

Image Interpretation, Photographic--see Photographs, Photography, and Photointerpretation

Immersion Suits--see Underwater (clothing and equipment)  
Impaired Hearing--see Ambient Noise (hearing loss); Audition (anomalies and individual differences)  
Incentives--see Individual Factors Affecting Performance (motivation and morale)  
Indicator and Warning Lights--see Displays (type); Warning and Signal Lights  
Indicators and Scales--see Displays (dial and scale design)

Individual Factors Affecting Performance

acceptability of and attitude toward equipment and tasks  
alertness  
aptitude and intelligence  
emotion  
fatigue and behavior decrement--see Work and Task Performance  
general  
motivation and morale  
personality  
set and attention  
thought processes

Industrial

deafness--see Ambient Noise (hearing loss)  
equipment, design of  
noise--see Ambient Noise (level)  
safety--see Safety (industrial)

Industry and Business, Human Factors Oriented Studies

Inertial Resistance--see Controls (resistance)

Infantry

squads--see Groups  
training--see Training (specific types)

Information--see also Communication Systems

analysis--see Communication and Information Theory  
processing, human--see Human  
reception, human--see Human  
storage and retrieval systems  
theory--see Communication and Information Theory  
transmission, human--see Human

Infrared Devices--see Light (special types)

Inhibition of Reception--see Sensory (interaction)

Injuries, Analysis of--see Safety

Input Channel, Comparison--see Sensory (comparison)

Input Channel, Interaction--see Sensory (interaction)

Instructions, Effects on Task Performance--see Individual Factors Affecting Performance (set and attention); Training (basic learning data)

Instrument Lighting--see also Light; Work Place Design (illumination)

color and intensity of illumination  
direct lighting and floodlighting  
edge and ring  
electroluminescent  
general  
rear (transillumination)

Intelligence--see Individual Factors Affecting Performance

Intelligence Testing--see Tests and Testing

Intelligibility--see Speech

Interaural Phase Cues--see Audition (sound localization)

Intercom Systems--see Speech (communication systems)

International Language--see Language Design

Interpersonal Behavior--see Social Interaction; Groups (interaction)

Intersensory Effects--see Sensory (interaction)

Interval Scaling--see Psychophysics (scaling)

Interview Technique--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems (other methods)  
Involuntary Reflexes--see Motor Performance and Skills  
Ionized Air--see Environmental Conditions and Effects  
Irradiation, Cosmic and Nuclear--see Environmental Conditions and Effects (radiation)  
Isolation--see Prolonged Confinement; Sensory (deprivation)

J

Job Description and Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems  
Job Performance Aids  
Judgment--see Individual Factors Affecting Performance (thought processes)  
Judgment, Psychophysical--see Psychophysics

K

Keyboard Design--see Panel and Console Design  
Kinesiology--see Anthropometric Measures  
Kinesthesia  
    coding  
    feedback--see Sensory (feedback)  
    general  
Knapsacks--see Packs and Carriers  
Knobs--see Controls (rotary movement)  
Knowledge of Results--see Individual Factors Affecting Performance (motivation and morale); Training (basic learning data)

L

Labels, Design of  
Landing Systems--see Aircraft  
Language Design (includes special alphabets and languages, context, synthetic speech and equipment)--see also Speech (basic characteristics)  
Lasers--see Environmental Conditions and Effects (radiation); Light (special types)  
Lateral G--see Motion, Effects of (acceleration and deceleration)  
Layout, Panels and Consoles--see Panel and Console Design; Work Place Design (arrangement of equipment and men)  
Leadership--see Groups  
Learning--see Training  
Legibility--see Numerals, Letters, and Characters, Design of; Printed Materials, Legibility, and Readability; Signs, Design of  
Leg Measurement--see Anthropometric Measures  
Lenses--see Optical Aids; Vision (equipment and methods)  
Letter Design--see Numerals, Letters, and Characters, Design of  
Levers--see Controls (linear movement)  
Life Jackets--see Controls (linear movement)  
Life Support Systems--see Ship and Submarine (habitability); Space Flight Systems  
Lifting--see Anthropometric Measures (muscular strength and endurance)  
Light  
    adaptation--see Visual (adaptation, pre-adaptation, and pre-exposure)  
    coding--see also Aircraft (lighting, exterior); Ship and Submarine; Warning and Signal Lights  
    colored  
    general  
    low level--see Vision (low level illumination)  
    measurement and specification--see also Visual (standards and specifications)  
    natural (i.e., daylight, high altitude, sky brightness, etc.)--see also Vision (effects of unusual environments)

Light (cont'd)

physical characteristics

signal--see Warning and Signal Lights

special types (i.e., black, broad band blue, infrared, polarized, ultraviolet)

Lighting Systems

aircraft--see Aircraft

indoors--see Work Place Design (illumination)

instrument--see Instrument Lighting

outdoors

airport

flares

floodlights and searchlights

general

highway and street

ships and submarines--see Ship and Submarine

workplace--see Work Place Design (illumination)

vehicle--see Vehicle

Limb Coordination--see Motor Performance and Skills

Limb. Flexibility--see Anthropometric Measures

Linearity of Human Operator--see Human (transfer functions)

Linguistics--see Language Design; Speech (basic characteristics)

Link Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Listening--see Speech (perception)

Load Carrying--see Anthropometric Measures (muscular strength and endurance); Work and Task Performance (capacity for production)

Load Stress--see Work and Task Performance (complexity)

Localization, Auditory--see Audition (sound localization)

Logistics--see also Game and Decision Theory

Loudness--see Audition (stimulus characteristics)

adaptation--see Audition (aftereffects of stimulation)

binaural vs. monaural--see Audition

coding--see Auditory (signals)

recruitment phenomena--see Audition (recruitment)

scales--see Audition (psychophysical scales)

summation--see Audition (stimulus characteristics)

Loudspeakers--see Auditory (equipment)

Low Level, High Speed Flight

Low Level Illumination--see Vision

Luminosity Curves--see Visual (thresholds)

M

Machine Noise--see Ambient Noise (level)

Machine Recognition (includes pattern and character recognition)--see also Computers

Machine Translation--see Translating Devices

Magnitude Estimation--see Psychophysics (methods)

Maintenance

behavior, strategies

design for

diagrams--see Job Performance Aids

equipment

general

systems

training--see Training (specific types)

Management--see Personnel; Systems Design (techniques of analysis)

Man-Assist

Mannikin Design--see Dummy and Mannikin Design  
 Manual Controls--see Controls  
 Manual Dexterity--see Motor Performance and Skills  
 Manuals, Design of--see Handbooks, Manuals, Texts, Design of  
Maps and Charts, Design of  
Marksmanship--see also Training (specific types)  
 Masking  
     auditory--see Auditory; Speech  
     odor--see Environmental Conditions and Effects; Smell and Taste  
     visual--see Visual (masking and interference)  
Masks  
 Master Slave Manipulator--see Controls (remote handling)  
Mathematical and Statistical Methods  
 Mathematical Models--see Computers; Mathematical and Statistical Methods  
 Melodic Patterns--see Audition (auditory patterns and meaning)  
 Mel Scale--see Audition (psychophysical scales)  
 Memory--see Retention; Training (basic learning data)  
 Men vs. Machines--see Assignment of Function to Men and Machines in Systems  
 Message Transmission--see Communications Systems; Speech (communication systems)  
 Metabolic Rate--see Physiological Capacities and Indices  
Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems  
     critical incident technique  
     decision analysis  
     experimental methods--see Research Techniques in Human Factors Engineering  
     general  
     job and task description and analysis  
     operations research  
     other methods  
     photographic techniques  
     queueing  
     system analysis--see System Design (techniques of analysis)  
     task description and analysis--see job, above  
     time and motion study  
 Micro Motion Study--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems  
 Microphones--see Auditory (equipment)  
 Mid-Air Collision--see Safety  
Military Standards and Specifications  
Miniaturization, Equipment--see also Equipment (design and evaluation)  
 Missile Noise--see Ambient Noise (level)  
 Missiles--see Weapons Systems, Design of (large-scale)  
 Mittens--see Clothing (handgear)  
 Mock-Ups--see Simulation and Simulators; Training Aids and Devices (mock-ups and models)  
 Models--see Computers; Mathematical and Statistical Methods  
 Monaural Stimulation--see Audition (binaural vs. monaural)  
 Monitoring Performance--see Vigilance and Monitoring (performance)  
 Monotonous Environments--see Sensory (deprivation)  
 Monte Carlo Methods--see Mathematical and Statistical Methods  
 Morale--see Individual Factors Affecting Performance (motivation and morale)  
 Morse Code Training--see Training (specific types)  
Motion, Effects of  
     acceleration and deceleration  
         general  
         protection  
         tolerance  
         types

Motion, Effects of (cont'd)

equipment and methods

general

perception of--see Perception

rotation and oscillation (includes amplitude and frequency)

sickness

vestibular functioning--see also Vestibular Function

vibration, whole body--see Vibration

Motion Pictures--see Films; Training Aids and Devices

Motivation--see Individual Factors Affecting Performance; Training (basic learning data)

Motor Performance and Skills

aiming

coordination of limbs

dimensional analysis

equipment and methods

general

handedness

involuntary reflexes

learning--see Training (specific types)

manual dexterity

positioning movements

reaction time--see Reaction Time and Refractory Period

repetitive movements (includes cranking and tapping)

serial movements

speed and precision

steadiness and tremor

tests of--see Tests and Testing

throwing

tracking--see Tracking

Motor Vehicle--see Vehicle

Movement

perception

bodily--see Perception

visual--see Visual (perception)

ratio, controls--see Control-Display Dynamics

restrictive effects of clothing--see Clothing (restrictive effects)

stereotypes--see Control-Display Dynamics

Multi-Channel Listening--see Auditory (displays, nonverbal); Speech

Multiple Image Photography--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Muscle Potential--see Physiological Capacities and Indices

Muscular Endurance--see Anthropometric Measures; Work and Task Performance

Muscular Strength--see Anthropometric Measures

Myopia--see Visual (anomalies and individual differences)

N

Narcosis, Deep Sea Divers--see Underwater (oxygen and pressure requirements)

NATO Phonetic Alphabet--see Language Design

Natural Ambient Illumination (daylight)--see Light (natural)

Navigational Aids and Systems--see also Space Flight Systems

Negative G--see Motion, Effects of (acceleration and deceleration)

Neural Theory

Night Blindness--see Visual (anomalies and individual differences)

Night Vision--see Vision (low level illumination)

## Noise

auditory--see Ambient Noise  
field--see Ambient Noise (measurement)  
masking--see Auditory; Speech  
meters--see Ambient Noise (equipment and methods)  
reduction--see Ambient Noise  
visual--see Visual (masking and interference)

Noxious Odors--see Environmental Conditions and Effects; Smell and Taste

Nuclear Operated Equipment and Systems, Problems of

Numerals, Letters, and Characters, Design of--see also Printed Material, Legibility, and Readability

Nutrition--see Diet, Food, and Nutrition

Nystagmus--see Eye (movement); Vision (effects of unusual environments)

## O

Obstacle Perception by Blind--see Audition (sound localization)

Oculogravic Effect--see Orientation in Space, Factors Determining; Perception (illusions)

Oculogyral Illusion--see Orientation in Space, Factors Determining; Perception (illusions)

Odorants--see Smell and Taste

Office Lighting--see Work Place Design (illumination)

Olfaction--see Smell and Taste

Operations Research--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems; Systems Design

Operator Opinion--see Individual Factors Affecting Performance (acceptability of and attitude toward equipment and tasks); Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Operator Position, Effects on Work Space Design--see Work Place Design

Opinion Survey--see Tests and Testing (motivation and opinion)

### Optical Aids

binoculars

general

glasses, spectacles, and goggles (includes contact lenses)

lenses and filters

periscopes

range finders

sights and reticles

telescopes

visors

### Orientation in Space, Factors Determining

Outdoor Lighting Systems--see Lighting Systems (outdoor)

Overlays--see Radar and other CRT Displays

## Oxygen

consumption--see Physiological Capacities and Indices

devices--see Breathing Devices and Equipment

masks--see Masks

requirements--see Environmental Conditions and Effects

toxicity--see Environmental Conditions and Effects

## P

Paced Work--see Work and Task Performance (pacing)

Packaging--see Containers and Packaging; for food--see Diet, Food, and Nutrition

Packboards--see Packs and Carriers

### Packs and Carriers

### Pain

### Paints, Finishes, and Surfaces

Palmar Resistance--see Physiological Capacities and Indices (galvanic skin response)

Panel and Console Design

aircraft and spacecraft

general

keyboard design

layout (includes grouping of components, orientation to operator, visual factors, limits of work area, etc.)

ships and submarines--see Ship and Submarine (controls, displays, and instrument panel design)

spacing between components--see layout, above

spatial dynamics, frequency of use of components, and order of use

vehicles--see Vehicle (controls, displays, and instrument panel design)

Parachutes

Parallax--see Displays (reading and interpretation problems)

Passageways--see Work Place Design

Pattern Perception--see Machine Recognition; Visual (perception)

Patterns of Communication--see Communication Systems; Groups (communication)

Pedals--see Controls (linear movement)

Peer Rating--see Personnel (assessment)

Perception--see also specific sensory categories

general

illusions

isolation--see Sensory (deprivation)

of body movement and position--see also Orientation in Space, Factors Determining

theory

time--see Time (perception)

Performance Aids--see Job Performance Aids

Peripheral Vision--see Visual (field)

Periscopes--see Optical Aids

Personality and Performance--see Individual Factors Affecting Performance

Personnel--see also Tests and Testing; Training

assessment

classification and assignment

evaluation--see assessment

general

management

selection

subsystem concepts

PERT (Program Evaluation and Review Technique)--see Systems Design (techniques of analysis)

Pharmacology--see Drugs

Phonetic Alphabet--see Language Design

Phonetic Analysis--see Speech (basic characteristics)

Phorias--see Visual (anomalies and individual differences)

Photic driving--see Physiological Equipment and Methods (electrophysiological techniques); Repetitive Stimulation, Effects of (visual)

Photographs, Photography, and Photo Interpretation

Photometry--see Vision (equipment and methods)

Physical Fitness and Performance--see also Exercise and Performance

Physical Stress--see Stress

Physiological Capacities and Indices

acclimatization--see also Environmental Conditions and Effects

breathing

cardio-vascular indices

electroencephalogram

electroretinogram--for technique, see Physiological Equipment and Methods; for data, see Vision (physiological mechanisms)

energy expenditure

galvanic skin response

general



Physiological Capacities and Indices (cont'd)

heart rate

metabolic rate

muscle potential

oxygen consumption

physical fitness

temperature, body (also includes thermal sensitivity, heat loss)

Physiological Equipment and Methods

electrophysiological techniques

general

metabolic measurement (includes calorimetry, respiratory, pulmonary, blood composition, heat balance, etc.)

other equipment and methods

telemetry--see also Space Flight Systems

Physique--see Anthropometric Measures

Pictorial Displays--see Displays

Pilot--see Flight

Pitch--see Audition (stimulus characteristics)

coding--see Auditory (signals)

shifts--see Audition (aftereffects of stimulation)

Plane of Controls Relative to Operator--see Panel and Console Design (layout)

Plotting Boards, Design of--see Displays (type)

Pointer Design--see Displays

Polar Coordinate Displays--see Displays (type)

Polarization, Light--see Light (special types)

Portability, Design for

Positioning Movements--see Motor Performance and Skills

Positioning of Components on Panels and Consoles--see Panel and Console Design (layout)

Positive G--see Motion, Effects of (acceleration and deceleration)

Posture--see Anthropometric Measures

PPI Display--see Radar and other CRT Displays

Predictor Instrument--see Displays (type)

Preferences--see Individual Factors Affecting Performance (acceptability of and attitude toward equipment and tasks)

Preference Testing--see Tests and Testing

Pressure Chambers--see Environmental Conditions and Effects (equipment and methods)

Pressure Suits--see Clothing

Printed Material, Legibility, and Readability--see also Numerals, Letters, and Characters, Design of; specific types (e.g., cards, graphs, maps)

Probabilistic Model--see Mathematical and Statistical Methods

Probability Learning--see Training (basic learning data)

Probability Theory--see Mathematical and Statistical Methods

Problem Solving Behavior--see Group (performance); Individual Factors Affecting Performance (thought processes)

Process Charts--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Proficiency Testing--see Tests and Testing

Programmed Instruction--see also Training Aids and Devices (teaching machines)

Prolonged Confinement--see also Sensory (deprivation)

Prolonged Performance--see Work and Task Performance

Prolonged Performance, Visual--see Vigilance and Monitoring (performance); Visual (comfort and fatigue)

Prone Position, Effects on Work Space Design--see Work Place Design

Proprioception--see Kinesthesia

Prosthetics

Protective Clothing--see Clothing

Protective Devices, Visual--see Optical Aids

Pseudophones--see Audition (equipment and methods)

Psychogalvanic Response--see Physiological Capacities and Indices

Psychogalvanometer--see Physiological Equipment and Methods (electrophysiological techniques)  
 Psycholinguistics--see Language Design; Speech (basic characteristics)  
 Psychological Stress--see Stress  
 Psychometrics--see Tests and Testing  
 Psychomotor Skills--see Motor Performance and Skills  
 Psychopharmacology--see Drugs  
 Psychophysical Scaling--see Psychophysics  
Psychophysics--see also Detection Theory  
   general  
   methods  
   scaling  
   theory  
 Public Address Systems--see Speech (communication systems)  
 Punch Cards, Design of--see Cards, Design of  
 Pursuit Apparatus--see Motor Performance and Skills (equipment and methods); Tracking (equipment and methods)  
 Push Buttons--see Controls (linear movement)

## Q

Q-Sort--see Tests and Testing (personality and sociometric)  
Quality Control  
 Quantitative and Qualitative Personnel Requirements Information (QQPRI)--see Personnel (subsystems concepts)  
 Questionnaires--see Tests and Testing  
 Queueing Theory--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems  
 Quickening--as a principle--see Control-Display Dynamics; used for Tracking--see Tracking

## R

### Radar and other CRT Displays

  fatigue--see Visual (comfort and fatigue)  
   general  
   noise and clutter  
   operator performance--see also Vigilance and Monitoring (performance); Visual (search and detection)  
   overlays  
   range and bearing scales and aids  
   screen  
     brightness  
     orientation and angle of mounting  
     size and shape  
   signal characteristics (e.g., pip brightness)  
   signal detectability  
   simulation  
   symbolology  
   television--see Television Displays  
   types (e.g., three dimensional, alphanumeric, etc.)  
 Radar Room Lighting--see Light (special types); Work Place Design (illumination)  
 Radar Training--see Training (specific types)  
 Radial Acceleration--see Motion, Effects of (acceleration and deceleration)  
 Radiation--see Environmental Conditions and Effects  
 Radiation Protective Clothing--see Clothing  
 Radio Range--see Auditory (displays, nonverbal)  
 Radio Systems--see Speech (communication systems)  
 Railroads--see Transportation Systems

Range Finder--see Optical Aids  
 Rate-Aided Controls--see Tracking  
 Rating Scales--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems; as a psychophysical technique--see Psychophysics (scaling)  
 Rations--see Diet, Food, and Nutrition  
 Ratio Scales--see Psychophysics (scaling)  
 Reach--see Anthropometric Measures (extent and flexibility of limb movement)  
Reaction Time and Refractory Period  
 Readability, Assessment of--see Printed Material, Legibility, and Readability  
Reading  
 Reading Devices for Blind--see Auditory (devices)  
 Reconnaissance--see Surveillance Systems; Visual (search and detection)  
 Recruitment Phenomena--see Audition  
 Red Illumination--see Light (special types)  
 Redout--see Motion, Effects of (acceleration and deceleration)  
 Redundancy--see Communication and Information Theory  
 Refractory Period--see Reaction Time and Refractory Period  
Reliability  
     equipment  
     human  
     systems  
 Remote Handling--see Controls  
 Repetitive and Rhythmic Movements--see Motor Performance and Skills  
Repetitive Stimulation, Effects of  
     auditory--see Audition (repetitive stimulation)  
     other  
         visual--see also Flash; Flicker  
 Repetitive Work--see Work and Task Performance  
Rescue Equipment--see also Sea (rescue)  
Research Techniques in Human Factors Engineering  
 Respiration--see Physiological Capacities and Indices  
 Respiratory Measurement Devices--see Physiological Equipment and Methods (metabolic measurement)  
 Rest Periods--see Work and Task Performance (length and distribution of work and rest periods)  
 Restraining Devices--see Belts, Harnesses, and other Restraining Devices  
Retention--see also Training (basic learning data)  
     long-term  
     short-term  
 Reward--see Individual Factors Affecting Performance (motivation and morale); Training (basic learning data)  
 Rifle Recoil--see Stress; Weapons Systems, Design of (handheld)  
 Rifles--see Weapons Systems, Design of (handheld)  
 Risk-Taking Behavior--see Game and Decision Theory; Individual Factors Affecting Performance (thought processes); Subjective Probability  
 Rocket Noise--see Ambient Noise (level)  
 Rotary Movement Controls--see Controls  
 Runway Design--see Aircraft (landing and landing systems)

## S

Safety--see also Escape from  
     accidents, analysis of  
         air  
         crash impact  
         general  
         industrial

Safety (cont'd)

motor vehicle and highway

sea--see also Sea (rescue)

shielding

Sampling Theory--see Mathematical and Statistical Methods

Satellites--see Space Flight Systems

Scale Design--see Displays (dial and scale design)

Scaling, Psychological--see Psychophysics (scaling)

Scheduling--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Scotopic Vision--see Vision (low level illumination)

Scramblers--see Auditory (equipment)

Sea

craft, design of--see Ship and Submarine

markers--see Signaling Systems, Visual

rescue (includes equipment)--see also Rescue Equipment; Visual (search and detection)

sickness--see Motion, Effects of

Search, Auditory--see Auditory (skills)

Searchlights--see Lighting Systems (outdoors)

Search, Visual--see Visual

Seats and Seating

belts--see Belts, Harnesses, and other Restraining Devices

body supports (includes bedding)

comfort

ejection--see also Ejection Capsules; Escape from (aircraft)

general

Selection--see Personnel (selection)

Self-Paced Work--see Work and Task Performance (pacing)

Sensation Scales--see Psychophysics

Sensory

comparison (i.e., comparison of one input channel with another)

deprivation--see also Prolonged Confinement

feedback

general

interaction (i.e., effects of stimulation in one modality on perception in another; includes facilitation and inhibition)

overload--see comparison, above

Sequence Diagrams--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Serial Movements--see Motor Performance and Skills

Servo Theory--see Cybernetics

Set--see Individual Factors Affecting Performance; Perception; Training (basic learning data); Vigilance and Monitoring

Sex Comparisons

Shape Coding--see Controls (coding); Tactile Coding

Shelters--see Houses, Dwellings, and Shelters, Design of

Shielding--see Ambient Noise (reduction and control); Safety

Ship and Submarine

communication systems--see Auditory (displays, nonverbal); Speech

controls, displays, and instrument panel design

crews--see Groups

escape systems

general

habitability (includes life support systems)

lighting systems

noise--see Ambient Noise (level)

Shivering--see Motor Performance and Skills (involuntary reflexes)

Shoes--see Clothing (footgear)

Sickness, Motion--see Motion, Effects of  
 Sidetones--see Speech (distortion)  
 Sights and Reticles, Design of--see Optical Aids  
 Signal Detection Theory--see Detection Theory  
Signaling Systems, Visual (e.g., hand signals, flags, smokes, dyes, flares)  
 Signal Lights--see Warning and Signal Lights  
 Signal-to-Noise Ratio--see Auditory (signals); Speech (distortion)  
Signs, Design of--see also Traffic (signs and signals)  
Simulation and Simulators--see also Computers  
 Sirens--see Auditory (displays, nonverbal)  
 Size Perception--see Visual (perception)  
 Skin Temperature--see Physiological Capacities and Indices (temperature, body)  
 Slave Manipulator--see Controls (remote handling)  
Sleep  
     physiological indices  
     work and performance  
 Sleep Deprivation--see Sleep  
Sleeping Bags  
 Small Groups--see Groups  
Smell and Taste  
 Smoke  
     concealment--see Fog, Haze, Smog, and Smoke  
     signaling devices--see Signaling Systems, Visual  
 Smoking, Effects of--see Drugs  
Social Interaction--see also Groups (interaction)  
 Sociometric Assessment--see Personnel (assessment)  
 Somatotyping--see Anthropometric Measures  
 Somesthetic Sense--see Kinesthesia; Pain; Physiological Capacities and Indices (temperature, body); Touch  
 Sonar--see Auditory (displays, nonverbal)  
     listening--see Auditory (skills)  
     training--see Training (specific types)  
 Sone Scale--see Audition (psychophysical scales)  
 Sonic Vibrations, Effects on Man--see Ambient Noise (effects on performance)  
 Sorting Systems--see Information (storage and retrieval systems); Mathematical and Statistical Methods  
 Sound  
     absorbers--see Ambient Noise (reduction and control)  
     localization--see Audition (sound localization)  
Space Flight Systems  
     capsule design  
         closed ecological system--see sealed cabin, below  
         communication  
         control and display systems  
         crews--see Groups  
         general  
         ground support  
         life support--see sealed cabin, below  
         navigation  
         panel and console design--see Panel and Console Design  
         sealed cabin  
         simulation--see Flight  
         suits--see Clothing  
         telemetry--see also Physiological Equipment and Methods  
         training--see Training (specific types)  
Space Travel--see also Motion, Effects of; Weightlessness  
     behavioral effects

Space Travel (cont'd)

biomedical problems

equipment and tools (includes feeding)

general

maneuvers and performance (docking, controlled flight, re-entry, work, etc.)

physiological effects

visual problems--see also Vision (effects of unusual environments)

Span of Attention--see Individual Factors Affecting Performance (set and attention)

Spatial Orientation--see Orientation in Space, Factors Determining

Speaking, Individual Differences

general

nationality

sex

Speech

articulation and intelligibility tests

audiometric testing

basic characteristics

information analysis

phonetic and phonemic analysis

spectral analysis

communication systems

aircraft

face-to-face

general

intercom, radio, and telephone

multi-channel

other

ship and submarine

spacecraft--see Space Flight Systems

vehicle

distortion

amplitude modulation

chopping, clipping

compression and expansion

delayed feedback

environmental effects (e.g., high altitude)

equipment, effects on (e.g., masks)

frequency

other

sidetones

signal-to-noise

equipment and methods

general

Intelligibility--see articulation and intelligibility testing, above; perception, below

masking

noise

pure tone

simultaneous speech

perception

recognizers

training--see Training (specific types)

Speed and Acceleration--see Motion, Effects of

Speed of Movement--see Motor Performance and Skills

Speed Stress--see Work and Task Performance (accuracy and speed requirements)

Statistical Methods--see Mathematical and Statistical Methods

Stature--see Anthropometric Measures  
 Steadiness--see Motor Performance and Skills  
 Stereophonic Sound--see Audition (sound localization)  
 Stereoscopic Acuity--see Visual (acuity)  
 Stereoscopic Vision--see Visual  
 Sterotypes, Motion--see Control-Display Dynamics  
 Stick Controls--see Controls (linear movement)  
 Stick Forces--see Controls (resistance)  
 Stochastic Methods and Models--see Mathematical and Statistical Methods  
 Stowage, Design for--see Work Place Design (area requirements)  
 Strategies--see Game and Decision Theory  
 Street Lighting--see Lighting Systems (outdoors)  
 Strength--see Anthropometric Measures  
Stress  
     general  
     physiological indices  
     psychological indices  
 Subjective Magnitude--see Psychophysics  
Subjective Probability--see also Game and Decision Theory  
 Sublingual Stimulation--see Perception  
 Submarine--see Ship and Submarine  
 Suits--see Clothing  
 Supine Position, Effects on Work Space Design--see Work Place Design  
Supply Systems  
 Supports, Body--see Belts, Harnesses, and other Restraining Devices; Seats and Seating  
Surveillance Systems--see also Visual (search and detection)  
 Survey Methods--see Tests and Testing  
Survival  
     equipment  
     in unusual environments  
         rations--see Diet, Food, and Nutrition  
 Sweating--see Physiological Capacities and Indices (temperature, body)  
 Swing Test--see Motion, Effects of (equipment and methods)  
 Switches--see Controls (linear movement)  
 Symbolic Displays--see Displays  
 Symbols, Design of--see Numerals, Letters, and Characters, Design of; Printed Material, Legibility, and Readability  
 Symposia and Conferences--see General and Comprehensive References in Human Factors Engineering  
 Synthetic Speech--see Language Design  
Systems Design  
     components--see specific categories, (e.g., Aircraft, Computers, Communication Systems, Radar and other CRT Displays, etc.)  
     general  
     techniques of analysis--see also Mathematical and Statistical Methods; Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems  
         evaluation  
         general  
         management and cost  
         reliability--see Reliability (systems)  
         simulation--see Simulation and Simulators  
     theory--see also specific categories, (e.g., Communication and Information Theory, Game and Decision Theory, etc.)

Tables and Graphs--see Graphs and Tables

Tactile Coding

Tank Crews--see Groups

Tanks--see Vehicle

Tapping Movements--see Motor Performance and Skills (repetitive movements)

Target Detection

auditory--see Auditory (skills)

visual--see Visual (search and detection)

Task Description and Analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

Task Performance--see Work and Task Performance

Taste--see Smell and Taste

Teaching Machines--see Programmed Instruction; Training Aids and Devices

Teams--see Groups

Telegraphic Systems--see Auditory (displays, nonverbal)

Telemetry--see Physiological Equipment and Methods; Space Flight Systems

Telephone Systems--see Speech (communication systems)

Telescopes--see Optical Aids

Television Displays--see also Training Aids and Devices

Temperature--see Environmental Conditions and Effects

body--see Physiological Capacities and Indices

sensitivity--see Physiological Capacities and Indices

Temporal Characteristics of Light--see Flash; Flicker; Light

Temporal Discrimination--see Time (perception)

Temporal Patterns, Sound--see Audition (auditory patterns and meaning)

Tents--see Houses, Dwellings, and Shelters, Design of

Tests and Testing

ability--see proficiency, below

aptitude and intelligence

construction

general

motivation and opinion

personality and sociometric

preference

proficiency (e.g., job skill tests)

psychomotor abilities

selection

Textbooks in Human Factors Engineering--see General and Comprehensive References in Human Factors Engineering

Texts, Design of--see Handbooks, Manuals, Texts, Design of

Texture Coding--see Tactile Coding

Thermal

environments--see Environmental Conditions and Effects

protective ensembles--see Clothing

radiation--see Environmental Conditions and Effects

sensitivity--see Physiological Capacities and Indices (temperature, body)

Thought Processes--see Individual Factors Affecting Performance

Throwing--see Motor Performance and Skills

Tilt, Perception of--see Orientation in Space, Factors Determining; Vestibular Function

Timbre--see Audition (stimulus characteristics)

Time

delay constants--see Controls (backlash, deadspace, and response lag)

error (audition)--see Audition (aftereffects of stimulation)

motion study--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems



Time (cont'd)

perception

sharing

Tinnitus--see Audition (aftereffects of stimulation)

Tobacco--see Drugs

Toggle Switches--see Controls (linear movement)

Tones (pure and complex)--see Audition

Tools, Design of

Torque- see Controls (resistance)

Touch

coding--see Tactile Coding

general

Toxic Environments--see Environmental Conditions and Effects

Tracking

aided controls

auditory

compensatory

controls

display factors

effects of environmental factors

equipment and methods--see also Motor Performance and Skills

feedback (augmented, delayed, etc.)

general

operator performance

pursuit

quickened display

signal characteristics

training--see Training (specific types)

transfer function--see Human (transfer functions)

visual vs. auditory

Traffic--see also Highway Research

air--see Air Traffic Control Systems

lights--see Warning and Signal Lights

motor vehicle

safety--see Safety (motor vehicle and highway)

signs and signals--see also Signs, Design of; Warning and Signal Lights

Training

basic learning data

characteristics of the learner

characteristics of material or task (includes degree of simulation)

distribution of practice

general

knowledge of results (includes reinforcement, feedback)

length of training

motivation

retention

set and attention (includes effects of instructions)

theories of learning

transfer

whole vs. part

comparison of methods

evaluation of programs

general

instructor behavior

specific types

air traffic control--see Air Traffic Control Systems

## Training

### specific types (cont'd)

basic (military)

code

flight

gunnery and marksmanship

infantry

maintenance

other

radar

sonar

space

tracking and motor skills

voice communication and language

## Training Aids and Devices

audio-visual

auditory

computers

display boards and other graphic materials

films

flight--see Flight (simulation); trainers and simulators, below

general

manuals--see also Handbooks, Manuals, Texts, Design of

mock-ups and models

other

slides and transparencies

teaching machines--see also Programmed Instruction

television

trainers and simulators

Tranquilizers--see Drugs

Transfer Function--see Human (transfer functions)

## Translating Devices

Transmission Lag--see Controls (backlash, deadspace, and response lag)

## Transportation Systems

Transverse G--see Motion, Effects of (acceleration and deceleration)

Tremor--see Motor Performance and Skills (steadiness and tremor)

Troubleshooting--see Maintenance (behavior, strategies)

Trucks--see Vehicle

Tumbling--see Motion, Effects of (acceleration and deceleration)

Twilight Conditions--see Vision (low level illumination)

Type Face and Legibility--see Numerals, Letters, and Characters, Design of; Printed Material, Legibility, and Readability

Typewriter Design--see Panel and Console Design (keyboard design)

Typewriting--see Motor Performance and Skills (serial movements)

## U

Ultraviolet Light--see Light (special types)

## Underwater

breathing apparatus

clothing and equipment

operational efficiency

oxygen and pressure requirements

sound systems (e.g., ASDIC and Sonar)--see Auditory (displays, nonverbal)

speech--see Speech (distortion)

targets, visual detection--see Visual (search and detection)

Veg Scale, Apparent Weight--see Kinesthesia; Psychophysics (scaling)

Vehicle (automobile, tank, truck, etc.)

accidents--see Safety (motor vehicle and highway)

communication systems--see Speech

controls, displays, and instrument panel design

design

general

handling qualities--see also Driving

lighting systems

safety--see Safety (motor vehicle and highway)

Velocity--see Visual (perception)

Ventilated Clothing--see Clothing (thermal protection)

Ventilation--see Environmental Conditions and Effects

Vernier Acuity--see Visual (acuity)

Vertigo--see Orientation in Space, Factors Determining

Vestibular Function

general

motion, effects on--see Motion, Effects of; Orientation in Space, Factors Determining

Vests

ballistic--see Clothing (body armor)

life--see Rescue Equipment

Vibration

effects on visual performance--see Vision (effects of unusual environments); for tracking, see Tracking (effects of environmental factors)

general

whole body

Vibratory Communication Systems--see Tactile Coding

Vigilance and Monitoring

general

performance--see also Auditory (skills)

theory

Visibility Threshold--see Visual (thresholds)

Vision

color vision

effects of unusual environments--see also Space Travel (visual problems); Visual (search and detection)

acceleration

high altitude

other

vibration

zero "g"

equipment and methods

general

illumination level

low level illumination

physiological mechanisms

psychophysical scales (e.g., brill scale)

signal characteristics (e.g., exposure time, duration)

tests

theories

Visors--see Clothing (headgear); Optical Aids

## Visual

accommodation and convergence

acuity

adaptation level

brightness contrast

dynamic

general

illumination (includes colored)

adaptation, pre-adaptation, and pre-exposure

aftereffects, afterimages

aging--see Aging, Effects of

anomalies and individual differences (e.g., color blindness, presbyopia, night blindness, etc.)

brightness discrimination

coding--see also Color

comfort and fatigue (includes glare)

defects--see anomalies and individual differences, above

enhancement devices--see Optical Aids

eye movement--see Eye

field

binocular

distorted

monocular

peripheral (includes comparisons of peripheral and foveal)

flicker--see Flicker

illusions--see Perception

information processing (includes channel capacity)

masking and interference

perception

angle

depth and distance

form and contour

movement (real and apparent)

number

pattern

size

velocity

protective devices--see Optical Aids

reaction time--see Reaction Time and Refractory Period

requirements (for industry, military, space flight, etc.)

search and detection

air to air

air to ground

air to sea--see also Sea (rescue)

general

ground to air

target detection

underwater targets

standards and specifications (includes Munsell, CIE diagram, etc.)

thresholds (e.g., visibility, recognition)

tracking--see Controls (eye); Tracking (visual vs. auditory)

Visual vs. Auditory Channel--see Sensory (comparison)

Vocality--see Audition (stimulus characteristics)

Vocoder--see Speech (recognizers); Translating Devices

Voice Communication--see Speech (communication systems)

Voice Communication Training--see Training (specific types)

VTOL, STOL Aircraft

W

War Games--see Game and Decision Theory

Warmth Discrimination--see Physiological Capacities and Indices (temperature, body)

Warning and Signal Lights

Warning Devices--see also Auditory (displays, nonverbal)

Watchkeeping Performance--see Vigilance and Monitoring

Water Environments--see Environmental Conditions and Effects; Underwater

Weapons Noise--see Ambient Noise (level)

Weapons Systems, Design of

general

handheld

intermediate-sized (e.g., turrets, anti-aircraft, machine guns)

large-scale (e.g., missile)

Weight, Body--see Anthropometric Measures (body size and dimensions)

Weight Discrimination--see Kinesthesia

Weight Lifting--see Anthropometric Measures (muscular strength and endurance); Exercise and Performance

Weightlessness--see also Motion, Effects of; Space Travel

Whiteout--see Vision (effects of unusual environments)

Whole Body Vibration--see Vibration (whole body)

Windblast--see Environmental Conditions and Effects

Windshields--see also Aircraft (design); Vehicle (design)

Work and Task Performance

accuracy and speed requirements

capacity for production

complexity (e.g., load, rate, and difficulty)

fatigue and behavior decrement

general

length and distribution of work and rest periods

method of study and measurement--see also Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems

motion analysis--see Methods and Techniques for Study and Analysis of Tasks, Operations, and Systems (time and motion study); Motor Performance and Skills (dimensional analysis)

pacing

physiological measures

space requirements--see Work Place Design

work-rest cycle--see length and distribution, above

Work Place Design

acoustics

area requirements (e.g., accessibility, clearances)

arrangement of equipment and men

atmospheric control

general

humidity and temperature--see atmospheric control, above

illumination--see also Instrument Lighting

aircraft lighting (cockpits, cabins)

command centers--see other facilities, below

factory, office, and home

general

lighting fixtures

other facilities requiring special lighting conditions

radar room

ship and submarine--see Ship and Submarine

specifications--see Light (measurement and specifications)

vehicle--see Vehicle

Work Place Design (cont'd)

passageways

seating arrangements

visibility, field of view

Work Place Evaluation (specific place)

FACSIMILE OF SUBJECT MATTER FILE

A

ACOUSTIC

DESIGN

25,882 25,888 25,932 26,051 26,143 26,842 27,515

ADAPTIVE SYSTEMS

26,848 27,309 27,663 27,972 28,107

AGING, EFFECTS OF

AUDITION

25,730 26,520

GENERAL

25,720 26,942 26,943 27,223 27,328 27,410 27,597 27,704 27,710

MOTOR PERFORMANCE

26,538 26,943

VISION

25,534 26,412 26,413 27,281

WORK CAPACITY

26,530 26,531 26,538 26,587 27,154 27,387 27,410 27,587 27,589 27,748  
27,760 27,847

AIRCRAFT

DESIGN

26,217 26,373 26,842 26,895 27,177 27,182 27,185 27,498 27,641 27,800  
27,802 27,822 27,999

GENERAL

25,979 26,147 26,303 26,305 26,838 27,200 27,864 28,034 28,036 28,049

LANDING AND LANDING SYSTEMS

26,102 26,263 26,296 26,727 26,730 26,732 26,733 26,734 26,846 26,896  
26,913 27,145 27,286 27,287 27,590 27,612 27,774 27,802

LIGHTING, EXTERIOR

27,616

RELATED EQUIPMENT

26,379 26,694 27,492

AIRPORT (AIRFIELDS)

FACILITIES

27,827

AIR TRAFFIC CONTROL SYSTEMS

COMMUNICATION AND INFORMATION FLOW

27,183 27,797

CONTROL PROBLEMS

27,183 27,797

EQUIPMENT

26,100 26,316 26,879 27,183 27,288

GENERAL

27,288 27,797

LAYOUT AND WORKPLACE DESIGN

26,879

OPERATOR VARIABLES

25,610 27,416 27,483 27,499

TRAFFIC FLOW

27,174 27,183 27,797 27,900

TRAINING AND SIMULATION

27,499

AMBIENT NOISEEFFECTS ON PERFORMANCE

25,561 25,867 25,882 25,926 26,070 26,120 26,143 26,146 26,156 26,540  
26,541 27,345 27,905

GENERAL

26,126 26,960 27,241 27,357 27,879 27,905

HEARING LOSS

25,921 25,938 26,082 26,122 26,945 27,232 27,238 27,879

LEVELAIRCRAFT

26,051 26,060 26,070 26,080 26,098 26,099 26,119 26,147 26,160 26,842  
27,421 27,639

AIRPORT

26,060 26,080 26,139 26,142 27,421 27,639

EQUIPMENT, GENERAL

28,131

INDUSTRIAL ENVIRONMENTS

27,357 27,880

OFFICE, HOME, AND GENERAL BACKGROUND

25,888 26,157 27,345

ROCKETS, MISSILES, AND LAUNCH FACILITIES

26,120 26,160 26,941

SHIPS AND SUBMARINES

25,992 27,623 28,067 28,068

WEAPONS

25,882 26,082 26,140 26,141 27,463

MEASUREMENT

25,856 25,932 26,132 26,157 26,160 26,960 27,357 27,463 28,071

REDUCTION AND CONTROLACOUSTIC SHIELDING

25,932 26,051 26,842 27,345

GENERAL

26,060 26,080 27,357

NOISE REDUCING DEVICES AND SYSTEMS

26,948 27,357

STANDARDS OF TOLERANCE AND ANNOYANCE

25,882 25,938 26,070 26,120 26,142 26,157 26,945 26,960 27,357 27,879  
27,880

ANTHROPOMETRIC MEASURESBIOMECHANICAL ANALYSIS

27,952

BODY DENSITY AND CENTERS OF GRAVITY

26,944

BODY SIZE AND DIMENSIONS

26,359 26,361 26,515 26,527 26,777 26,943 27,137 27,653 27,845

EQUIPMENT AND METHODS

25,649 26,942 26,944 27,112 27,113 27,143 27,565 27,957

EXTENT AND FLEXIBILITY OF LIMB MOVEMENT

26,342 26,346 26,352

GENERAL

26,844

HEAD DIMENSIONS

27,844 27,846

LOCOMOTION

26,512 27,957



ANTHROPOMETRIC MEASURES (CONT'D)MUSCULAR STRENGTH AND ENDURANCE

25,649 25,887 26,529 26,534 27,243 27,462

POSTURE

26,515

ARTIFICIAL INTELLIGENCE

26,905 27,257 27,853 27,875 27,943 28,107

ASSIGNMENT OF FUNCTIONS TO MEN AND MACHINES IN SYSTEMS

26,217 26,380 26,416 26,913 27,107 27,561 27,682

AUDITIONAFTEREFFECTS OF STIMULATION

25,595 25,604 25,922 25,926 25,933 25,940 26,082 26,122 26,129 26,163

26,558 26,562 26,595 26,674 26,945 27,320 27,905

ANOMALIES AND INDIVIDUAL DIFFERENCES

25,926 25,929 26,329 26,520 26,564 26,565 26,566 26,567 26,568 26,569

AUDITORY PATTERNS AND MEANING

25,890 25,900 25,901

BINAURAL VS. MONAURAL

25,594 25,806 25,889 25,891 25,900 25,906 25,907 25,918 25,922 25,941

25,942 25,943 26,144 26,684 27,017 27,057

EQUIPMENT AND METHODS

25,904 25,940 26,128 26,153 26,561 26,564 26,566 26,570 28,839 26,989

27,322 27,327

GENERAL

26,569 27,220

NORMS

26,564 26,565 26,566 26,567 26,568

PHYSIOLOGICAL MECHANISMS

25,896 25,904 25,914 25,919 25,923 25,924 26,334 26,563 26,667 26,980

27,322 27,538 27,667

PSYCHOPHYSICAL SCALES

25,750 25,772 25,904 27,072 27,372

REPETITIVE STIMULATION

25,939 26,560

SOUND LOCALIZATION

25,765 25,788 25,895 25,896 25,918 25,930 25,941 25,942 25,943 26,097

26,137 26,163 26,616 27,135 27,320

STIMULUS CHARACTERISTICSFREQUENCY AND PITCH

25,634 25,894 25,942 26,162 26,334 26,657 27,036 27,066 27,322

INTENSITY AND LOUDNESS

25,634 25,750 25,772 25,856 25,903 25,914 25,920 25,924 25,939 26,162

26,334 26,560 26,972 27,017 27,322

OTHER

25,900 25,901 26,163 26,334

STIMULUS MIXTURES

25,856 25,895 25,901 25,912 25,941

THRESHOLDS

25,889 25,904 25,912 25,917 25,919 25,924 25,939 26,082 26,129 26,520

26,557 26,560 26,561 26,945 27,327 27,667

AUDITORYDEVICESEAR DEFENDERS

26,051 26,570 26,948 27,816 27,882 27,965

ENHANCEMENT DEVICES

25,570 25,788 26,067 27,293 27,294 27,297 27,298 27,299 27,300 27,301

27,302

AUDITORY (CONT'D)

DISPLAYS, NONVERBAL

FLIGHT GUIDANCE SYSTEMS

27,774

INTERMITTENT WARNING AND SIGNALING DEVICES

26,066 26,581 27,652

MULTI-CHANNEL

25,743

SONAR AND OTHER UNDERWATER SOUND SYSTEMS

25,988

EQUIPMENT

INPUT DEVICES

26,067 26,851

OUTPUT DEVICES

26,067 26,118 26,154 26,851

MASKING

25,734 25,856 25,889 25,893 25,894 25,906 25,917 25,918 25,924 25,928

25,933 25,934 25,935 26,570

SIGNALS

CHANNEL CAPACITY

25,730 25,743 25,806 25,905 25,977 26,672

CODING

27,071

FEEDBACK

25,604 25,734 25,748 25,916 26,025 26,026

GENERAL CHARACTERISTICS

25,866 25,900 25,906 25,966 25,988 26,109

TO-NOISE RATIO

25,795 25,892 25,898 25,899 25,907 25,934 25,937

SKILLS

DISCRIMINATION

25,594 25,795 25,853 25,878 25,916 25,937 25,967 26,789 26,972

MONITORING

25,892 25,988 26,078 26,581 27,038 27,323

SEARCH AND DETECTION

25,906 25,907 26,152 27,323 27,935

AUTOMATION

26,593 26,995 27,871

BELTS, HARNESSES, AND OTHER RESTRAINING DEVICES

27,176 27,254 27,746

BIODYNAMICS

27,952

BIONICS

25,831 26,713

BREATHING DEVICES AND EQUIPMENT

26,884 27,492

CAMOUFLAGE AND CONCEALMENT

26,214 26,494 26,697 26,699 27,604 27,605 27,909 27,963

CLOTHINGARCTIC ENSEMBLES AND COLD WEATHER

26,200 26,206 26,390 27,677

BELTS AND FASTENERS

27,147

BODY ARMOR

26,225

EQUIPMENT AND METHODS

26,198 26,200 26,514 26,949 27,147 27,161 27,773

FABRICS

26,094 27,161

FLIGHT

26,051

FOOTGEAR

26,200 27,192 28,108

GENERAL

27,150 27,605

HANDGEAR

26,200 26,213 26,223 26,347 26,390

HEADGEAR

26,318 26,711 27,315 28,083

HIGH ALTITUDE AND ANTI-G

26,051 26,198 26,350 26,711 26,952 27,422 27,464 27,474

NOXIOUS AGENTS, PROTECTION

26,830 27,854

RADIATION PROTECTION

26,753 26,857 27,854

RESTRICTIVE EFFECTS

26,103 26,104 26,105 26,207 26,223

SIZING, TECHNIQUES OF MEASUREMENT

26,225 27,653

SPACE SUITS

26,051 26,207 26,208 26,209 26,210 26,212 26,342 26,343 26,344 26,345

26,346 26,348 26,349 26,351 26,352 26,691 26,711 26,749 26,952 27,262

27,271 27,666

THERMAL PROTECTION

26,210 26,212 26,390 26,392 26,949 27,161 27,464 27,884 28,079 28,080

28,111

COLORCODING

26,172 26,265 26,296 26,418 26,625 26,659 27,746 27,809 27,868

COMFORT

27,800

COMMAND AND CONTROL SYSTEMS

26,262 26,288 26,341 26,774 26,795 27,123 27,127 27,129 27,152 27,188

27,305 27,618 27,837 28,009 28,015

COMMUNICATION AND INFORMATION THEORYGENERAL

25,732 25,862 26,478 27,128 27,282 27,377 27,620 27,902 28,032 28,112

INFORMATION ASSESSMENT AND PROCESSING

25,539 25,603 25,773 25,795 25,805 25,871 25,892 25,951 25,955 25,978

26,020 26,024 26,043 26,172 26,182 27,191 27,379

REDUNDANCY, UNCERTAINTY

25,603 25,700 25,773 25,774 25,804 25,805 25,955 25,971 26,270 27,379

27,852

COMMUNICATION SYSTEMSGENERAL

25,977 26,108 26,123 26,723 26,795 27,530 27,628 27,786 27,834 27,866

28,032 28,112 28,114 28,115

TECHNIQUES FOR EVALUATION

26,478 26,869

COMPUTERSDATA PROCESSING SYSTEMS

25,569 25,840 26,005 26,017 26,197 26,288 26,384 26,490 26,698 26,868

26,875 26,976 27,011 27,277 27,381 27,577 27,583 27,584 27,601 27,621

27,627 27,631 26,888 26,889 26,901 28,052

GENERAL

25,897 26,101 26,872 27,571 28,099

MAN INTERACTION

26,264 26,322 26,525 26,877 27,157 27,188 27,284 27,309 27,794 27,890

28,031 28,116 28,117 28,118

MODELS AND PROGRAMS

25,968 26,019 26,234 26,255 26,877 26,976 27,011 27,382 27,651 27,657

27,871 27,892 27,893

SIMULATION

26,106 27,853 27,909 27,943 28,012 28,018

SYSTEMS COMPONENT

26,288 27,628 28,032

CONTAINERS AND PACKAGING

26,220 27,791

CONTROL-DISPLAY DYNAMICSCOMPATABILITY AND MOTION STEREOTYPES

25,600 25,996 25,997 26,165 26,289

GENERAL

25,996 26,072 26,326

INTEGRATION

25,549 25,996 26,326

CONTROLSAIRCRAFT

26,289 26,734 26,754 26,889 26,895 26,934 27,177 27,395 27,458 27,590

27,796 27,799 27,803 28,026

AUTOMATIC

27,590 27,796 27,799

CODING

26,290

COMPARISON OF TYPES

26,511 27,395

EYE (AS CONTROL MECHANISM)

26,457 26,978 27,131 27,288 27,431

FORCE AND TIME TO ACTIVATE

26,627 26,889

GENERAL

26,041 26,861 26,926

CONTROLS (CONT'D)

HANDGRIPS AND HANDLES

26,289

LINEAR MOVEMENT

LEVERS AND STICKS

26,511 26,889

PUSH BUTTONS AND TOGGLE SWITCHES

26,290

LOCATION AND POSITIONING

26,289

REMOTE HANDLING

26,253 27,199

ROTARY MOVEMENT

KNOBS

26,072

CYBERNETICS

26,040 26,262 26,341 26,417 26,530 26,707 26,905 27,196 27,550 27,853  
27,909 28,032

DETECTION THEORY

25,566	25,688	25,694	25,707	25,708	25,753	25,760	25,769	25,777	25,779
25,780	25,868	25,869	25,870	25,878	25,892	25,898	25,899	25,910	25,911
25,913	25,917	25,961	25,987	25,989	25,990	25,991	26,086	26,117	26,166
26,241	26,386	26,416	26,506	26,507	26,789	26,924	26,933	26,939	27,023

27,110

DIET, FOOD, AND NUTRITION

26,055	26,130	26,208	26,251	26,286	26,800	27,109	27,142	27,156	27,162
27,213	27,406	27,408	27,417	27,493	27,727	27,861	27,903	27,970	28,085

28,127

DISPLAYSDIAL AND SCALE DESIGN

26,224	26,418	26,421	26,518
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GENERAL

25,695	26,075	26,108	26,259	26,260	26,299	26,300	26,321	26,917	27,665
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POINTER DESIGN

26,063	26,323	26,518
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READING AND INTERPRETATION PROBLEMS

25,607	25,679	25,694	25,879	26,063	26,295	26,311	26,418	26,421	26,518
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26,535

SIZE AND SHAPE

25,996	25,998
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TYPEALTIMETERS

26,310	26,323	26,537	27,795
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ATTITUDE INDICATORS

25,980

COMBINED DISPLAYS

25,549	26,302	26,695	27,285	27,286	27,973	27,987
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COMPARISON OF TYPES

25,879	25,980	25,998	25,999	26,172	26,523	26,530	26,535	27,286
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INDICATOR AND WARNING

26,296

LARGE DISPLAYS

25,998	25,999	26,222	26,297	26,916	26,975	27,209	27,518	27,746
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OTHER

25,980	25,999	26,288	26,295	26,296	26,299	26,309	26,317	26,518	26,519
26,537	26,927	26,975	27,285	27,314					

DIURNAL CYCLES

25,535	25,611	27,276	27,437	27,527
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DRIVINGANALYSIS OF

26,282	26,313	26,320	26,829
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PERFORMANCE AND SKILLS

26,196	26,282	26,540	26,541	27,111	27,566	27,567
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DRUGS

25,610	25,819	25,842	25,868	25,974	26,023	26,042	26,168	26,329	26,529
26,689	26,712	26,740	26,741	26,742	26,743	26,744	26,775	26,853	26,905
26,950	27,164	27,383	27,417	27,454	27,465	27,500	27,506	27,619	27,620
27,654	27,708	27,730	27,771	27,911	27,975				

DUMMY AND MANNIKIN DESIGN

26,886	27,143	27,565
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EJECTION CAPSULE

26,077 26,219 26,280 26,816 26,818 27,685 28,014

ENVIRONMENTAL CONDITIONS AND EFFECTSAIR VELOCITY

25,880 26,248

ATMOSPHERIC PRESSURE26,000 26,208 26,768 26,950 26,952 26,958 27,149 27,455 27,476 27,497  
27,744 27,749 27,768 27,922 28,076 28,102COLD25,880 26,089 26,167 26,200 26,201 26,522 27,368 27,493 27,654 27,677  
27,705 27,707 27,735 27,736 27,824 27,916 28,027DECOMPRESSION26,700 26,702 26,808 26,815 26,955 26,967 27,384 27,424 27,425 27,460  
27,461 27,769EQUIPMENT AND METHODS

26,216 26,765 26,768 26,788 26,950 26,951 27,083 27,251 27,754 27,805

EVAPORATIVE COOLING

26,953

GENERAL25,692 25,839 26,092 26,327 26,342 26,343 26,357 26,751 26,771 26,783  
26,929 26,957 27,215 27,244 27,544 27,604 27,818 27,883 28,034HOT26,115 26,528 26,539 26,709 26,776 26,949 26,953 26,961 26,962 26,964  
27,479 27,484 27,532 27,703 27,708 27,709 27,722 27,724 27,725 27,733  
27,763 27,917 28,083HUMIDITY

26,522 26,953

IONIZED AIR

25,883 26,788 27,397

OXYGEN REQUIREMENTS26,211 26,765 26,979 27,095 27,394 27,420 27,424 27,425 27,467 27,469  
27,471 27,497 27,673 27,717 27,756 27,922RADIATION25,807 25,831 26,008 26,055 26,057 26,202 26,232 26,688 26,837 26,886  
26,946 26,954 26,956 27,168 27,230 27,240 27,247 27,274 27,319 27,360  
27,361 27,363 27,393 27,400 27,415 27,432 27,438 27,455 27,472 27,494  
27,495 27,509 27,793TEMPERATURE

27,346 27,388 27,731

THERMAL RADIATION25,745 25,880 26,210 26,212 26,248 26,257 26,338 26,539 26,709 26,823  
26,961 26,963 26,964 27,141 27,426 27,445 27,508 27,765 27,766 27,884TOLERANCE, ADAPTATION, ACCLIMATIZATIONALTITUDE AND PRESSURE

26,836 26,950 26,990 27,149 27,716 27,717

COLD

26,206 26,870 27,368 27,916

HEAT26,385 26,539 26,709 27,708 27,709 27,723 27,726 27,729 27,732 27,748  
27,751TOXIC ENVIRONMENTS26,211 26,750 26,768 26,830 26,947 26,951 26,958 26,966 26,970 27,172  
27,195 27,228 27,229 27,231 27,235 27,251 27,252 27,488 27,490 27,521  
27,789 27,971VENTILATION

26,053 26,226 27,707

ENVIRONMENTAL CONDITIONS AND EFFECTS (CONT'D)

WATER

26,766 26,955 26,961 27,318 27,404 27,482 27,677 27,734 27,758

WINDBLAST, AIRBLAST, WINDCHILL

26,248 26,854

EQUIPMENT

DESIGN AND EVALUATION

25,695 26,113 26,117 26,515 26,736 26,839 26,950 27,005 27,006 27,293

27,294 27,295 27,296 27,297 27,298 27,299 27,300 27,301 27,302 27,412

27,569 27,584 27,681

EQUIPMENT USED IN HUMAN FACTORS RESEARCH

25,517 25,589 25,626 25,715 26,216 26,259 26,770 27,472

ERROR

HUMAN

25,559 26,857 27,157 27,201 27,458 27,537 28,003

ESCAPE FROM

AIRCRAFT AND SPACECRAFT

26,049 26,077 26,690 26,816 26,818 27,407 27,485 27,956

EXERCISE AND PERFORMANCE

26,512 26,513 26,536 26,539 26,785 27,215 27,392 27,462 27,532 27,700

27,701 27,712 27,713 27,719 27,720 27,750 27,776 27,885 27,912 27,918

27,919 27,920

EYE

DOMINANCE

25,551 25,554 25,672 25,729 25,761

MOVEMENT

25,525 25,582 25,636 25,676 25,740 25,837 25,851 25,995 26,074 26,088

26,258 26,439 26,457 26,471 26,663 26,712 26,823 27,051 27,097 27,308

27,329 27,431 27,470 27,487 27,497 27,642



FACILITIES

26,016 26,216 26,255 26,796 27,242 27,472 27,887

FILMS 26,016 26,216 26,255 26,796 27,242 27,472 27,887

DISPLAY USE 26,016 26,216 26,255 26,796 27,242 27,472 27,887

26,523 26,016 26,216 26,255 26,796 27,242 27,472 27,887

FIRE FIGHTING

EQUIPMENT

26,084 26,216 26,255 26,796 27,242 27,472 27,887

FLASH 26,084 26,216 26,255 26,796 27,242 27,472 27,887

BLINDNESS

26,277 26,284 26,287 26,291 26,307 26,395 26,403 26,471 26,843 27,312

26,362 26,438 26,615 26,629 26,974 26,974 26,974 26,974 26,974 26,974

RATE

26,028 26,162 27,326

VISIBILITY

26,401 26,466 26,847 27,642

FLICKER

25,527 25,534 25,583 25,646 25,864 26,027 26,028 26,033 26,037 26,038

26,052 26,183 26,406 26,442 26,454 26,524 26,743 27,009 27,019 27,047

27,049

FLIGHT

GUIDANCE SYSTEMS

26,304

PERFORMANCE AND SKILLS

26,000 26,001 26,002 26,304 26,778 27,395 27,405 27,417 27,423 27,441

27,475 27,510 27,527 27,802 27,821 27,988

SIMULATION

25,656 25,821 25,979 25,981 25,994 26,000 26,054 26,056 26,081 26,096

26,138 26,336 26,382 26,731 26,817 26,846 26,901 27,085 27,209 27,272

27,275 27,428 27,429 27,459 27,563 27,614 27,798 27,805 27,811 27,820

27,964 27,983 28,019

TESTING 26,016 26,216 26,255 26,796 27,242 27,472 27,887

27,200 27,872 27,999

FLUORESCENT AND LUMINOUS MATERIALS

26,850 27,440 26,850 27,440 26,850 27,440 26,850 27,440

FOG, HAZE, SMOG, AND SMOKE

27,251 27,252 27,824

GAME AND DECISION THEORY

25,577 25,762 25,773 25,874 25,951 25,953 25,990 26,191 26,262 26,322  
 26,480 26,504 26,507 26,508 26,510 26,597 26,634 26,806 26,922 26,933  
 26,940 27,207 27,256 27,375 27,586 27,649 27,650 27,670 27,761 27,853  
 27,878 27,906 27,928 27,929 27,930 28,015 28,032

GENERAL AND COMPREHENSIVE REFERENCES IN HUMAN FACTORS ENGINEERINGARTICLES AND REPORTS

25,833 25,975 26,011 26,029 26,044 26,093 26,216 26,255 26,780 26,783  
 26,888 27,107 27,233 27,234 27,236 27,237 27,374 27,376 27,377 27,528  
 27,569 27,680 27,842 27,843 28,049

BIBLIOGRAPHIES

25,524 25,529 25,552 25,638 25,683 25,690 25,699 26,215 26,369 26,791  
 26,838 27,146 27,149 27,680 27,775

BOOKS

28,034 28,035 28,132

HANDBOOKS

26,273 27,364 27,640 27,658

SYMPOSIA AND CONFERENCES

26,849 26,914 26,929 27,576 27,858 27,925 27,952 27,980 28,009 28,012

GRAPHS AND TABLES, DESIGN OF

26,224 27,812

GROUPSAIRCRAFTS

26,188 27,179 27,182 27,200 27,477 27,545 28,034

COMMUNICATION

25,822 25,946 25,947 26,584 27,179 27,190 27,545 27,813

EVALUATION

26,965 27,630

GENERAL

25,822 25,828 27,826

INTERACTION

25,946 26,171 26,188 26,372 26,584 26,965 27,190 27,380 27,660 27,779  
 27,850 27,994

LEADERSHIP

25,790 26,671 27,831 27,876 27,877 28,089 28,090 28,092 28,096 28,106

MORALE

27,117 27,190

PERFORMANCE

25,768 25,998 26,095 26,171 26,188 26,372 26,584 26,720 26,938 26,965  
 26,968 27,190 27,303 27,375 27,611 27,630

RESEARCH TECHNIQUE

25,828 28,005

SELECTION

26,188

SHIP AND SUBMARINE CREWS

26,106

SIZE AND STRUCTURE

25,812 25,822 26,965 27,660

THEORY

25,812 26,372 27,536 27,850 27,994

HANDBOOKS, MANUALS, TEXTS, DESIGN OF

26,009 26,010 26,577 26,930 27,130 27,950 28,090 28,094 28,104

HELICOPTERS

26,001 26,002 26,778 26,894 26,899 27,210 27,407 27,456 27,616 27,634

27,798 27,804 27,874 27,987 27,993

HIGHWAY RESEARCH

26,041 26,181 26,282 26,313 26,801 27,566 27,567

HOUSES, DWELLINGS, AND SHELTERS, DESIGN OF

26,053 26,057 26,084 26,174 26,214 26,226 26,324 26,721 27,346 27,544

27,995 28,027 28,030 28,084 28,091 28,092 28,093 28,094 28,096 28,104

28,124

HUMANCONTROLLER

26,934 27,458

INFORMATION PROCESSING CAPABILITIES

25,528 25,533 25,539 25,597 25,603 25,608 25,640 25,655 25,663 25,668

25,707 25,730 25,731 25,743 25,746 25,759 25,767 25,773 25,781 25,804

25,805 25,806 25,872 25,879 25,953 25,955 25,958 25,960 25,977 26,020

26,024 26,170 26,172 26,182 26,300 26,341 26,505 26,508 26,541 26,585

26,660 26,863 27,157 27,410 27,542 27,598 27,620 27,670 27,809 27,932

28,113

TRANSFER FUNCTIONS

26,331 26,339 26,737 26,864 27,205 27,259 27,261 27,263 27,848

INDIVIDUAL FACTORS AFFECTING PERFORMANCEACCEPTABILITY OF AND ATTITUDE TOWARD EQUIPMENT AND TASKS

26,177 26,178 26,179 26,185 26,187 26,599 27,120 27,246 27,279 27,688

27,859

ALERTNESS

25,878 27,109 27,323

APTITUDE AND INTELLIGENCE

26,180 26,715 26,867 27,151 27,216

EMOTION

25,692 25,705 25,710 25,947 25,952 26,071 26,168 26,551 26,740 26,741

27,027 27,439

GENERAL

25,594 25,833 26,173 26,175 26,177 26,178 26,356 27,116

MOTIVATION AND MORALE

25,519 25,681 25,947 25,952 26,064 26,168 26,177 26,178 26,179 26,180

26,185 26,187 26,587 26,594 26,603 26,741 26,867 26,920 27,027 27,109

27,169 27,246 27,439 27,552 27,637 27,688 27,788 27,994 27,997

PERSONALITY

26,095 26,568 26,629 26,653 26,912 27,169 27,328 27,636 27,814 28,002

28,029

SET AND ATTENTION

25,515 25,702 25,836 25,963 26,163 26,170 26,677 27,027 27,035 27,049

27,108 27,439 27,646 27,761 27,944

THOUGHT PROCESSES

25,692 25,720 25,768 25,836 25,987 26,191 26,194 26,235 26,341 26,417

26,505 26,510 26,525 26,573 26,809 27,027 27,030 27,169 27,469 27,542

27,552 27,598 27,611 27,637 27,670 27,779 27,896 27,942 27,943 27,944

27,945 27,961 27,986

INDUSTRY AND BUSINESS, HUMAN FACTORS ORIENTED STUDIES

25,826 26,185 26,587 26,594 27,157 27,218 27,239 27,244 27,246 27,842

27,843

INFORMATION

STORAGE AND RETRIEVAL SYSTEMS

25,530	25,572	26,029	26,197	26,255	26,863	26,865	26,866	27,122	27,125
27,528	27,601	27,602	27,622	27,625	27,631	27,633	27,664	27,669	27,786
27,828	27,836	27,886	27,887	27,891	27,901	28,023	28,026		

INSTRUMENT LIGHTING

COLOR AND INTENSITY OF ILLUMINATION

26,308 27,973

ELECTROLUMINESCENT

26,274 28,100

J - K

JOB PERFORMANCE AIDS

25,879 26,283 26,722 26,745 27,130 27,671 27,672 27,950

KINESTHESIS

CODING

26,116

GENERAL

25,560	25,575	25,625	25,628	25,737	25,801	25,851	26,045	26,161	26,661
26,973	26,991	27,018	27,033						

LANGUAGE DESIGN

25,838	25,975	26,113	26,123	26,124	26,158	26,545	26,546	26,547	26,549
26,617	26,877	27,519	27,520	27,548	27,553	27,651	27,828	27,834	27,894
27,896	27,927	27,962	27,977	27,978	27,982	28,109	28,115		

LIGHTCOLORED

26,265

MEASUREMENT AND SPECIFICATION

26,362 26,434 26,436

NATURAL

26,434 26,436 27,818

PHYSICAL CHARACTERISTICS

26,362

SPECIAL TYPES

26,362 26,436 26,492 26,975 27,668 27,902

LIGHTING SYSTEMSOUTDOORSAIRPORT

26,263 27,581

GENERAL

26,369 26,493

HIGHWAY AND STREET

26,449

LOGISTICS

25,874	26,003	26,004	26,005	26,006	26,007	26,008	26,009	26,010	26,011
26,012	26,013	27,249	27,305	27,511	27,543	27,544	27,575	27,755	27,790
27,852	27,858	28,000	28,009	28,010	28,011	28,012			

LOW LEVEL, HIGH SPEED FLIGHT

25,979	26,000	26,233	26,725	26,726	26,731	27,160	27,163	27,395	27,405
27,800	27,825	28,019	28,121						

MACHINE RECOGNITION

25,970	26,040	26,264	26,375	26,850	26,868	27,197	27,264	27,516	27,546
27,621	27,626	27,669	27,909	28,008	28,107	28,128	28,130		

MAINTENANCEBEHAVIOR, STRATEGIES

26,135 26,190 26,812 26,882 26,883

DESIGN FOR

26,008 26,231 26,379 26,389 26,871 26,882 26,883 27,202 27,403 27,770

EQUIPMENT

26,073 27,289 27,403 27,671 27,672

GENERAL

26,008 26,013 26,112 26,722 27,130 27,572 27,966 28,000

SYSTEMS

26,008 26,489 27,827 27,967

MAPS AND CHARTS, DESIGN OF

26,150 26,233 26,250 26,317 27,604 28,097

MARKSMANSHIP

27,857

MASKS

26,015 26,223 26,830 27,140 27,425

MATHEMATICAL AND STATISTICAL METHODS

25,681	25,782	25,793	25,814	25,816	25,817	25,824	25,825	25,829	25,834
25,844	25,845	25,852	25,875	26,004	26,236	26,238	26,386	26,482	26,502
26,503	26,508	26,509	26,579	26,698	26,755	26,804	26,864	26,876	26,903
26,906	26,910	26,929	26,951	27,064	27,132	27,133	27,134	27,136	27,258
27,261	27,382	27,467	27,536	27,541	27,547	27,553	27,555	27,579	27,582

MATHEMATICAL AND STATISTICAL METHODS (CONT'D)

27,647 27,650 27,656 27,661 27,783 27,792 27,808 27,852 27,863 27,873  
27,878 28,032 28,126

METHODS AND TECHNIQUES FOR STUDY AND ANALYSIS OF TASKS, OPERATIONS, AND SYSTEMS

DECISION ANALYSIS

27,518 28,013

GENERAL

27,572

JOB AND TASK DESCRIPTION AND ANALYSIS

25,826 26,002 26,135 26,381 26,491 26,514 26,593 26,805 27,606 27,609  
27,739 27,742 27,785

OPERATIONS RESEARCH

26,420 26,478 26,479 27,895 27,992 28,110

OTHER METHODS

25,573 26,175 26,234 26,235 26,303 26,305 26,488 26,590 26,592 26,877  
27,782 27,787 27,807

PHOTOGRAPHIC TECHNIQUES

26,207 26,527 27,846

QUEUEING

26,484 26,485 26,486 26,490 27,181 27,780 27,992

TIME AND MOTION STUDY

25,553 26,207 26,342 26,521 27,781

MILITARY STANDARDS AND SPECIFICATIONS

26,093 26,481 26,911 27,167 27,949 28,022

MOTION, EFFECTS OF

ACCELERATION AND DECELERATION

GENERAL

26,061 26,207 26,258 26,281 26,343 26,542 26,831 26,832 26,833 26,836  
26,854 26,885 27,316 27,419 27,423 27,433 27,457 27,673 27,910 27,913  
28,034

PROTECTION

25,555 26,854 27,398 27,404

TOLERANCE

26,076 26,690 26,764 26,813 26,818 26,829 26,854 27,385 27,468 27,479  
27,486 27,497 27,531 27,745 28,017

TYPES

26,834 27,266 27,385 27,405 27,407 27,422

EQUIPMENT AND METHODS

26,042 27,457 28,025 28,078

GENERAL

26,107 26,827 27,458

ROTATION AND OSCILLATION

25,677 26,042 26,074 26,107 26,114 26,266 26,692 26,758 26,820 26,821  
26,822 26,826 26,835 27,266 27,308 27,396 27,412 27,414 27,487 27,531

SICKNESS

26,042 26,114 26,249 26,387 26,689 26,759 26,775 26,782 26,810 26,811  
26,814 26,815 26,831 26,874 27,316 27,383 27,391 27,430

VESTIBULAR FUNCTIONING

25,677 26,054 26,056 26,074 26,107 26,114 26,258 26,266 26,269 26,387  
26,692 26,810 26,820 26,822 26,826 26,827 26,835 26,885 26,923 26,981  
27,398 27,431 27,433 27,487 27,531

MOTOR PERFORMANCE AND SKILLS

COORDINATION OF LIMBS

25,609 26,512 26,712 27,654

DIMENSIONAL ANALYSIS

25,976

EQUIPMENT AND METHODS

25,576 25,659 26,326 26,367

MOTOR PERFORMANCE AND SKILLS (CONT'D)

GENERAL

25,519 25,553 25,590 25,661 25,683 25,737 25,738 25,766 25,784 25,797  
25,823 25,854 25,887 26,342 26,344 26,345 26,348 26,349 26,353 26,536  
26,537 26,540 26,836 27,662

HANDEDNESS

27,243

INVOLUNTARY REFLEXES

25,713 25,854

MANUAL DEXTERITY

25,609 26,347 27,243 27,619

POSITIONING MOVEMENTS

25,737 25,784 26,532 26,712 26,748

REPETITIVE MOVEMENTS

25,574 25,675 25,775 26,518

SERIAL MOVEMENTS

25,569 26,186 26,517 26,588 28,114

SPEED AND PRECISION

25,569 25,643 25,647 26,342 26,344 26,345 27,469 27,537 27,600

STEADINESS AND TREMOR

26,465 26,712

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NAVIGATIONAL AIDS AND SYSTEMS

26,233 26,856 26,857 27,204 27,686

NEURAL THEORY

25,677 25,827 25,851 25,855 25,876 25,969 26,116 26,338 26,363 26,999  
27,007 27,010 27,013 27,014 27,657 27,810

NUCLEAR OPERATED EQUIPMENT AND SYSTEMS, PROBLEMS OF

26,008

NUMERALS, LETTERS, AND CHARACTERS, DESIGN OF

25,879 26,172 26,184

OPTICAL AIDS

BINOCULARS

26,465

GENERAL

26,475 26,843 27,892 27,893

GLASSES, SPECTACLES, AND GOGGLES

26,307 26,475 27,140 27,245 27,350 27,351 27,352 27,353 27,356 27,363  
27,399 27,884

LENSES AND FILTERS

26,291 26,431 27,963

SIGHTS AND RETICLES

26,046

TELESCOPES

26,296

ORIENTATION IN SPACE, FACTORS DETERMINING

25,523 25,588 25,620 25,633 25,737 25,785 25,847 25,963 26,031 26,054  
26,056 26,107 26,161 26,258 26,266 26,329 26,387 26,712 26,729 26,761  
26,770 26,821 26,822 26,826 26,827 26,835 26,886 27,396 27,412 27,443  
27,458 27,487 27,497 27,991

PACKS AND CARRIERS

26,514 27,147 27,985

PAIN

25,515 25,709 25,745 25,974 26,023 26,087 26,947 26,963 27,334 27,767

PAINTS, FINISHES, AND SURFACES

27,868

PANEL AND CONSOLE DESIGNAIRCRAFT AND SPACECRAFT

26,217 26,694 27,286

GENERAL

25,996 26,288 27,581

KEYBOARD DESIGN

25,569 26,290 26,517 26,530 26,585 27,546

LAYOUT

25,996 26,217 26,538 26,693 26,694

SPATIAL DYNAMICS, FREQUENCY OF USE OF COMPONENTS, AND ORDER OF USE

26,694

PARACHUTES

26,071 26,738 27,173 27,418 27,420 27,969

PERCEPTIONGENERAL

25,524 25,529 25,552 25,602 25,614 25,624 25,630 25,638 25,658 25,671

25,690 25,699 25,837 26,194 26,857 27,028 27,075 27,388 27,551 27,931

ILLUSIONS

25,518 25,541 25,550 25,571 25,619 25,621 25,706 25,726 25,850 25,859

26,117 26,256 26,411 26,621 26,855 27,031 27,070 27,458 27,592

OF BODY MOVEMENT AND POSITION

25,523 26,031 26,161 26,281 27,396 27,458

THEORY

25,617 25,633 25,755 25,764 25,785 25,846 25,847 25,848 25,849 25,860

25,861 25,959 25,963 25,964 25,965 26,608 26,674 27,334 27,529 27,540

27,551 27,961

PERSONNELASSESSMENT

25,950 26,167 26,169 26,173 26,175 26,176 26,179 26,180 26,425 26,573

26,576 26,579 26,582 26,590 26,591 26,592 26,867 26,911 26,912 26,995

27,243 27,417 27,499 27,651 27,679 27,785

CLASSIFICATION AND ASSIGNMENT

26,911 26,912 27,679

GENERAL

25,826 25,950 26,179 26,234 26,328 26,799 27,125 27,219 27,248 27,387

27,659 27,835 27,842 27,877 27,949

MANAGEMENT

26,179 26,590 26,716 26,904 27,246 27,627 27,649 27,876 27,877 28,006

28,092 28,104

SELECTION

26,175 26,180 26,254 26,333 26,872 26,882 26,883 26,911 26,912 27,079

27,081 27,082 27,243 27,442 27,662 27,998 28,001 28,087 28,095

SUBSYSTEM CONCEPTS

27,342 27,573

PHOTOGRAPHS, PHOTOGRAPHY, AND PHOTO INTERPRETATION

25,584 25,601 26,065 26,150 26,199 26,204 26,242 26,276 26,306 26,317

26,714 26,852 26,938 26,977 27,379 27,604 27,617 27,643 27,957 28,048

28,097



PHYSICAL FITNESS AND PERFORMANCE

26,048	26,176	26,495	26,496	26,497	26,498	26,499	26,500	26,536	26,859
27,462	27,480	27,662	27,721	27,752	27,764	27,776	27,919		

PHYSIOLOGICAL CAPACITIES AND INDICESACCLIMATIZATION

26,950	26,990	27,916	27,922
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BREATHING

25,703	26,018	26,853	26,966	26,979	27,095	27,395	27,476	27,707	27,710
27,711	27,718	27,720	27,740	27,750	27,885	27,907	27,912	27,913	27,914

CARDIO-VASCULAR INDICES

25,555	25,704	26,704	26,797	26,969	27,008	27,250	27,369	27,410	27,411
27,428	27,429	27,437	27,441	27,493	27,496	27,500	27,501	27,502	27,508
27,532	27,654	27,700	27,716	27,719	27,760	27,907	27,919		

ELECTROENCEPHALOGRAM

25,691	25,705	25,716	25,717	25,945	26,045	26,272	26,362	27,363	26,557
26,785	26,979	26,980	26,981	26,982	26,983	26,984	26,990	26,991	26,992
26,993	26,994	26,996	26,998	26,999	27,000	27,001	27,002	27,003	27,004
27,007	27,008	27,009	27,010	27,011	27,012	27,013	27,014	27,015	27,038
27,321	27,323	27,328	27,331	27,341	27,367	27,372	27,477	27,948	

ENERGY EXPENDITURE

26,360	26,512	26,513	26,514	26,533	26,536	26,706	27,215	27,464	27,718
27,772	27,885	27,921							

GALVANIC SKIN RESPONSE

25,540	25,636	25,702	25,703	25,705	25,709	25,710	25,711	25,783	25,798
25,983	26,018	26,045	26,828	26,998	27,019	27,038	27,687	27,697	

GENERAL

25,555	25,692	25,818	25,876	25,957	26,330	26,356	26,536	26,707	26,942
26,957	27,196	27,246	27,248	27,712	28,007	28,034	28,077		

HEART RATE

25,540	25,702	25,703	25,704	25,709	25,983	26,018	26,157	26,336	26,785
26,797	27,019	27,099	27,311	27,395	27,411	27,436	27,687	27,885	27,919

METABOLIC RATE

26,061	26,208	26,785	27,389	27,442	27,464	27,469	27,493	27,500	27,501
27,502	27,918								

MUSCLE POTENTIAL

25,696	25,854	26,018	26,325	26,536	26,705	26,708	26,788	27,687	27,948
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OXYGEN CONSUMPTION

26,513	26,514	26,785	26,853	26,979	27,392	27,423	27,469	27,488	27,490
27,493	27,701	27,713	27,714	27,715	27,718	27,772	27,885	27,918	27,919
27,920									

PHYSICAL FITNESS

26,785	27,246
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TEMPERATURE, BODY

25,703	25,709	25,745	25,763	26,229	26,338	26,528	26,539	26,691	26,785
26,823	26,887	26,962	26,964	27,426	27,445	27,527	27,654	27,655	27,702
27,706	27,711	27,722	27,724	27,725	27,730	27,762	27,766	27,767	27,844
27,916	27,917	27,919	27,924						

PHYSIOLOGICAL EQUIPMENT AND METHODSELECTROPHYSIOLOGICAL TECHNIQUES

25,540	25,599	25,612	25,702	25,703	25,705	25,711	25,712	25,714	25,715
25,716	25,717	25,811	25,818	25,840	25,854	25,904	26,083	26,114	26,123
26,294	26,325	26,355	26,363	26,400	26,705	26,708	26,788	26,923	26,979
26,980	26,981	26,982	26,985	26,986	26,987	26,990	26,991	26,997	26,998
26,999	27,003	27,004	27,005	27,006	27,007	27,008	27,009	27,010	27,011
27,012	27,013	27,014	27,015	27,096	27,208	27,283	27,321	27,322	27,323
27,326	27,328	27,336	27,341	27,411	27,815	28,016			

PHYSIOLOGICAL EQUIPMENT AND METHODS (CONT'D)

GENERAL

25,698 26,215 27,196 27,454 27,952 27,953

METABOLIC MEASUREMENT

26,338 26,706 26,712 26,823 26,946 26,951 26,959 26,966 26,969 26,990

27,250 27,311 27,445 27,459 27,462 27,743 27,753 27,759 27,910 27,911

27,912 27,913 27,914 27,916 27,924

OTHER EQUIPMENT AND METHODS

25,831 25,957 25,973 26,335 26,357 26,704 26,750 26,788 26,797 26,942

26,944 26,951 26,956 26,967 26,969 27,009 27,010 27,170 27,419 27,459

27,467 27,915 27,918 27,923 27,947 27,954 27,990

TELEMETRY

26,050 26,860 26,862 27,435 27,955 28,052

PORTABILITY, DESIGN FOR

26,220

PRINTED MATERIAL, LEGIBILITY, AND READABILITY

25,879 25,970 26,182 26,184 26,264

PROGRAMMED INSTRUCTION

26,058 26,252 26,364 26,368 26,370 26,376 26,377 26,577 26,578 26,715

26,792 26,795 26,873 26,878 27,504 27,535 27,782 27,785 28,020

PROLONGED CONFINEMENT

25,568 25,637 25,701 26,174 26,785 26,969 27,117 27,214 27,317 27,462

28,030 28,089 28,090 28,092 28,096 28,124

PROSTHETICS

25,970 26,213 26,978 27,957 27,958 27,959

PSYCHOPHYSICS

GENERAL

25,533 25,538 25,547 25,566 25,580 25,668 25,749 25,750 25,772 25,786

25,844 25,875 26,162 26,395 26,679 26,789 27,020 27,224 27,340 27,539

27,809

METHODS

25,539 25,550 25,559 25,592 25,663 25,708 25,870 25,925 26,240 26,261

26,607 26,744 26,932 26,974 27,020 27,024 27,065 27,155 27,409

SCALING

25,565 25,645 25,650 25,682 25,708 25,736 25,745 25,760 25,787 25,802

26,087 26,135 26,278 26,504 26,506 26,583 26,613 26,668 26,718 26,828

26,922 26,936 26,937 26,973 27,018 27,029 27,034 27,045 27,054 27,119

27,191 27,224 27,593

THEORY

25,593 25,764 25,786 25,846 25,856 25,875 25,913 26,597 26,717 27,054

28,088

QUALITY CONTROL

27,180 27,201 27,777

RADAR AND OTHER CRT DISPLAYSGENERAL

27,494

NOISE AND CLUTTER

27,898

OPERATOR PERFORMANCE

26,189 26,191

SCREENBRIGHTNESS

26,321

SIGNAL CHARACTERISTICS

25,993 26,321

SIGNAL DETECTABILITY

25,993 26,189 26,191 27,617

SYMBOLOLOGY

27,899

TYPES

26,204 26,317 26,337 27,285

REACTION TIME AND REFRACTORY PERIOD

25,542 25,544 25,556 25,585 25,589 25,599 25,603 25,611 25,613 25,626

25,640 25,643 25,652 25,655 25,657 25,666 25,669 25,707 25,718 25,746

25,751 25,753 25,767 25,778 25,798 25,803 25,884 25,885 25,886 25,899

25,965 25,979 25,983 25,984 26,035 26,502 26,503 26,596 26,662 26,674

26,675 27,022 27,110 27,527 27,588 27,948 28,076

READING

25,808 25,879 26,184 26,293 26,526 26,586 27,080 27,693 27,694

RELIABILITYEQUIPMENT

27,583 27,584

HUMAN

26,175 26,735

SYSTEMS

26,735 27,561 27,601 27,852 28,032

REPETITIVE STIMULATION, EFFECTS OFVISUAL

25,613 26,037 26,269 26,272 26,441 27,280 27,372

RESCUE EQUIPMENT

27,652

RESEARCH TECHNIQUES IN HUMAN FACTORS ENGINEERING

25,517 25,589 25,833 25,852 25,968 26,516 26,698 27,541 27,660 27,806

RETENTIONLONG-TERM

25,528 25,830 25,832 25,835 25,857 25,949 25,954 25,960 26,025 26,026

26,030 26,034 26,036 26,162 27,689

SHORT-TERM

25,528 25,651 25,678 25,680 25,720 25,724 25,730 25,731 25,735 25,741

25,744 25,759 25,777 25,780 25,781 25,806 25,810 25,827 25,832 25,835

25,855 25,857 25,858 25,865 25,866 25,867 25,871 25,872 25,877 25,902

25,948 25,949 25,954 25,960 25,967 25,978 26,024 26,025 26,026 26,030

26,034 26,036 26,170 26,544 26,550 26,602 26,606 26,628 26,638 26,648

26,649 26,655 26,656 26,669 26,680 26,776 27,597 27,689 27,692 27,696

27,936 27,937 27,938 27,939 27,940 27,941 28,122

SAFETYACCIDENTS, ANALYSIS OF

25,982	26,077	26,196	27,170	27,171	27,173	27,176	27,349	27,354	27,402
27,409	27,418	27,443	27,446	27,447	27,448	27,449	27,450	27,451	27,452
27,453	27,456	27,503	27,517	27,555	28,017	28,081			

AIR

25,982	26,081	26,818	26,830	27,171	27,173	27,176	27,399	27,402	27,407
27,409	27,418	27,420	27,443	27,446	27,447	27,448	27,449	27,450	27,451
27,452	27,453	27,458	27,485	27,503	27,517	27,521	27,555	27,632	27,833
28,081									

CRASH IMPACT

26,690	27,482	27,517	27,745	27,956	27,993				
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GENERAL

27,255	27,348	27,350	27,351	27,352	27,353	27,355	28,089		
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INDUSTRIAL

26,521	27,249	27,348	27,349	27,354	27,355	27,356			
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MOTOR VEHICLE AND HIGHWAY

26,041	26,181	26,196	26,254	26,282	26,313	27,291	27,354	27,517	
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SHIELDING

27,192	27,274								
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SEARESCUE

27,440	27,652	28,086							
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SEATS AND SEATINGBODY SUPPORTS

26,880	27,086								
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EJECTION

25,841	26,077	26,818	27,485						
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GENERAL

26,515	26,542	27,176	27,634	27,993					
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SENSORYCOMPARISON

25,558	25,595	25,615	25,618	25,630	25,632	25,651	25,666	25,788	25,873
25,878	25,905	25,911	26,117	26,162	26,619	26,973	27,025	27,034	

DEPRIVATION

25,543	25,546	25,598	25,631	25,637	25,701	25,962	26,174	26,650	26,666
27,052	27,439								

FEEDBACK

25,575	25,617	25,625	25,670	25,677	25,704	25,727	25,737	25,765	25,784
25,797	25,847	25,851	26,218						

GENERAL

25,801	25,831	26,123	26,845	27,697					
--------	--------	--------	--------	--------	--	--	--	--	--

INTERACTION

25,523	25,558	25,575	25,597	25,605	25,615	25,618	25,620	25,622	25,627
25,628	25,633	25,763	25,769	25,788	25,873	25,961	25,988	25,989	26,028
26,108	26,109	26,161	26,269	26,540	26,541	26,612	26,620	26,651	26,672
26,676	26,971	27,053	27,413	27,414	27,855				

SEX COMPARISONS

25,574	25,594	25,673	25,783	25,808	26,587	26,678	27,721	27,760	27,917
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SHIP AND SUBMARINECONTROLS, DISPLAYS, AND INSTRUMENT PANEL DESIGN

27,533	27,580								
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ESCAPE SYSTEMS

28,086									
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GENERAL

26,235	26,237	26,800	26,867	26,969	28,022				
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SHIP AND SUBMARINE (CONT'D)HABITABILITY

25,992 26,769 27,172 27,317

LIGHTING SYSTEMS

26,275

SIGNALING SYSTEMS, VISUAL

26,285

SIGNS, DESIGN OF

25,975 26,181 26,265 26,493

SIMULATION AND SIMULATORS

26,062 26,073 26,096 26,106 26,260 26,342 26,346 26,391 26,477 26,483

26,766 26,796 26,802 26,907 26,988 27,563 28,012

SLEEPPHYSIOLOGICAL INDICES

25,591 25,715 26,336 26,363 26,980 26,998 27,159 27,321 27,338 27,341

27,654 27,867 27,975

WORK AND PERFORMANCE

25,691 25,804 26,739 26,819 27,321 27,444 27,527 27,867

SLEEPING BAGS

26,392

SMELL AND TASTE

25,565 25,593 25,787 25,802 25,973 26,195 26,667 27,919 27,023 27,222

27,841 27,923

SOCIAL INTERACTION

26,925 27,380 27,637 27,660 27,814 28,029 28,030

SPACE FLIGHT SYSTEMSCAPSULE DESIGN

26,049 26,207 27,267 27,268 27,274 27,275 27,465 27,869

COMMUNICATION

26,723 27,505

CONTROL AND DISPLAY SYSTEMS

26,358 26,701 26,733 26,790 26,927 26,928 27,126 27,265 27,268 27,269

27,272 27,869 27,870

GENERAL

26,069 26,073 26,374 26,728 26,771 26,902 27,189 27,262 27,275 27,358

27,359 27,559 27,560 28,036 28,049 28,050 28,051

GROUND SUPPORT

26,120 26,768

NAVIGATION

26,703 26,730 27,203 27,204 27,206 27,265 27,272 27,273

SEALED CABIN

26,357 26,691 26,763 26,765 26,786 26,958 27,121 27,193 27,390 27,401

27,471 27,473 27,507 27,881 27,971 28,024

TELEMETRY

26,068 26,085 26,131 26,332 26,763 26,875 27,124 27,138 27,268 27,435

27,436 27,489 27,574 28,052

SPACE TRAVELBEHAVIORAL EFFECTS

26,207 26,354 26,836 26,918 27,951

BIOMEDICAL PROBLEMS

26,042 26,107 26,208 26,211 26,232 26,330 26,357 26,387 26,689 26,763

26,766 26,768 26,771 26,775 26,797 26,825 26,830 26,836 26,841 26,875

26,929 26,957 26,958 27,172 27,276 27,319 27,400 27,415 27,419 27,465

27,471 27,486 27,488 27,489 27,490 27,496 27,501 27,502 27,508 27,509

27,562 27,776 28,050

EQUIPMENT AND TOOLS

26,073 26,198 26,208 26,212 26,219 27,156 27,213 27,289 27,359 27,386

27,472

SPACE TRAVEL (CONT'D)GENERAL

26,069	26,085	26,752	26,763	26,767	26,798	26,838	26,840	26,918	27,226
27,227	27,262	27,358	27,359	27,386	27,466	27,559	27,560	27,817	28,036
28,048	28,049	28,051	28,087						

MANEUVERS AND PERFORMANCE

25,981	26,096	26,219	26,358	26,730	26,733	26,749	26,755	26,756	26,762
26,784	26,836	26,890	26,891	26,892	26,893	26,897	26,918	26,927	26,928
27,265	27,269	27,270	27,273	27,289	27,392	27,403	27,414	27,422	27,465
27,523	27,849	27,870	27,908	27,951	28,051				

PHYSIOLOGICAL EFFECTS

26,342	26,343	26,350	26,351	26,758	26,763	26,766	26,797	26,824	26,825
26,918	27,369	27,394	27,400	27,424	27,428	27,429	27,462	27,465	27,471
27,478	27,489	27,496	27,501	27,502	27,666	27,776			

VISUAL PROBLEMS

25,981	26,096	26,424	26,900	27,288	27,413
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SPEAKING, INDIVIDUAL DIFFERENCESGENERAL

25,684	25,813	26,551	27,197	27,635
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NATIONALITY

26,159	28,115
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SPEECHARTICULATION AND INTELLIGIBILITY TESTS

25,725	25,891	25,898	25,929	25,936	25,944	26,159	26,563	26,571	27,057
27,548	27,904	28,101							

AUDIOMETRIC TESTING

25,929	26,572	27,904
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BASIC CHARACTERISTICSINFORMATION ANALYSIS

26,121	26,124	26,136	26,548	27,139
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PHONETIC AND PHONEMIC ANALYSIS

25,684	25,813	26,155	26,719	27,139	27,427	27,548	28,109
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SPECTRAL ANALYSIS

25,909	26,552	27,139	27,277	27,427
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COMMUNICATION SYSTEMSAIRCRAFT

26,154	27,292
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FACE-TO-FACE

25,936	27,282	27,505
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GENERAL

25,898	25,936	25,944	27,306	27,548	27,982	28,101
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INTERCOM, RADIO, AND TELEPHONE

25,936	26,133	26,318	27,505	27,897	28,129
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MULTI-CHANNEL

25,905	25,977
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OTHER

26,271	26,563	26,845	27,522
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DISTORTIONAMPLITUDE MODULATION

26,151
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COMPRESSION AND EXPANSION

25,915
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DELAYED FEEDBACK

25,604	25,670	25,678	25,680	25,734	25,748	26,025	26,026	26,635	26,636
26,719	27,059								

FREQUENCY

25,929
--------

OTHER

26,148	28,115
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SPEECHDISTORTION (CONT'D)SIDETONES

26,719

SIGNAL-TO-NOISE

25,898 25,936

EQUIPMENT AND METHODS

25,915 26,571 26,705 27,139 27,277 27,278 27,832

GENERAL

25,718 25,838 25,853 25,936 26,145 26,159 27,139 27,514 27,695 27,728

27,741

MASKINGNOISE

25,867 25,891 25,929 25,936 26,572 26,719 28,067 28,068 28,070 28,071

PERCEPTION

25,756 25,853 26,121 26,136 26,155 26,559 26,563 26,571 26,921 27,031

27,306 27,427 27,635 27,904 28,021 28,114 28,115

RECOGNIZERS

25,897 25,908 26,125 26,383 26,905 27,139 27,427 27,624

STRESSGENERAL

26,425 26,533 26,867 27,027 27,303 27,373 27,530 27,645

PHYSIOLOGICAL INDICES

25,551 25,647 25,691 25,709 25,710 25,716 25,818 26,336 26,340 26,698

26,709 26,828 26,920 26,959 27,389 27,416 27,419 27,436 27,483 27,885

27,946 28,030

PSYCHOLOGICAL INDICES

25,543 25,556 25,567 25,926 25,962 26,340 26,709 26,828 27,114 27,115

27,118 27,194 27,416 27,436 27,481 27,484 28,030

SUBJECTIVE PROBABILITY

25,782 26,504 26,507 26,508 26,510 26,793 27,187 27,866 27,878

SUPPLY SYSTEMS

27,790 27,992 28,012

SURVEILLANCE SYSTEMS

26,062 26,322 26,728 26,852 27,178 27,212 27,659 28,028

SURVIVALEQUIPMENT

26,174 26,201 26,251 26,849 27,304 27,677 27,969

IN UNUSUAL ENVIRONMENTS

26,079 26,964 27,310 27,415 27,970 27,995 28,053 28,089 28,090 28,092

28,124

SYSTEMS DESIGNGENERAL

26,003 26,093 26,288 26,479 27,249 27,374 27,376 27,377 27,640 27,852

28,032

TECHNIQUES OF ANALYSISEVALUATION

26,416 26,476 27,180 27,186 27,630 27,786 27,888

GENERAL

26,004 26,111 26,420 26,915 27,865

MANAGEMENT AND COST

26,012 26,013 26,380 26,481 26,483 27,608 27,804 27,819 27,823 27,858

THEORY

27,374 27,376 27,377 27,989

I

TACTILE CODING

25,516 25,547 25,597 25,615 25,618 25,628 25,788 25,800 25,927 25,931  
 25,970 26,113 26,117 26,123 26,845 26,935 27,294 27,295 27,296 27,297  
 27,365 27,366 27,370 27,554 27,815

TELEVISION DISPLAYS

25,648 26,021 26,063 26,260 26,317 26,321 27,775 27,806 27,829 27,830  
 27,898 27,899

TESTS AND TESTING

APTITUDE AND INTELLIGENCE

26,576 26,591 27,335

CONSTRUCTION

25,844 26,173 26,575 26,647 27,335 27,536

GENERAL

25,557 25,576 25,834 25,836 25,844 26,173 26,193 26,573 26,582 26,821  
 27,859 28,005

MOTIVATION AND OPINION

26,575 26,920 27,079 27,997

PERSONALITY AND SOCIOMETRIC

26,574 26,576 26,589 27,079 27,082

PREFERENCE

26,195 26,667

PROFICIENCY

26,173 26,223 26,574 26,579 26,582 26,588 26,867 27,079 27,080 27,148  
 27,151

PSYCHOMOTOR ABILITIES

27,764 27,806

SELECTION

26,249 27,081 27,335 27,607 27,679

TIME

PERCEPTION

25,520 25,532 25,580 25,581 25,592 25,606 25,629 25,662 25,693 25,763  
 25,966 25,967 26,678 27,840 27,934

SHARING

25,615 26,976 27,889 27,890 28,118

TOUCH

GENERAL

25,516 25,547 25,597 25,615 25,618 25,647 25,788 25,800 25,801 25,873  
 25,927 25,931 25,970 26,087 26,113 26,117 26,123 26,643 26,654 26,675  
 26,676 26,845 26,935 27,025 27,033 27,365 27,366 27,370 27,554 27,815

TRACKING

COMPENSATORY

25,516 25,549 25,561 25,697 25,727 25,976 25,994 26,018 26,339 27,260  
 27,491

CONTROLS

25,976 26,014 26,542 27,146 27,491

DISPLAY FACTORS

25,727 25,757 25,976 26,018 26,117 26,186 27,491

EFFECTS OF ENVIRONMENTAL FACTORS

25,561 26,779 26,832 27,414

EQUIPMENT AND METHODS

25,517 25,659 25,697 26,326 26,542 27,258 27,261

FEEDBACK

25,600 25,727 25,737 25,775 25,797 27,106 27,491

GENERAL

25,727 25,732 25,766 26,014 26,326 26,747 27,184



TRACKING (CONT'D)OPERATOR PERFORMANCE

25,561 25,686 25,687 25,727 25,766 26,018 26,326 26,737 27,019 27,414

PURSUIT

25,686 25,775 25,976 26,186 26,819 27,491

QUICKENED DISPLAY

25,641 26,339

SIGNAL CHARACTERISTICS

25,994

TRAFFICMOTOR VEHICLE

26,041 26,282 26,801

SIGNS AND SIGNALS

26,041 26,181

TRAININGBASIC LEARNING DATACHARACTERISTICS OF THE LEARNER

26,911

CHARACTERISTICS OF MATERIAL OR TASK

25,579 25,590 25,664 25,687 25,722 25,742 25,830 25,862 25,952 26,127

26,171 26,182 26,292 26,543 26,686 26,878 27,044 27,378 27,687 27,691

27,784 27,938

DISTRIBUTION OF PRACTICE

25,639 25,976 26,543

GENERAL

25,521 25,544 25,576 25,577 25,754 25,819 25,824 27,599 27,692 28,122

KNOWLEDGE OF RESULTS

25,536 25,545 25,704 25,738 25,754 25,916 25,937 25,946 26,367 26,517

26,968 27,022 27,325 27,378 27,578 27,856 27,871 28,018

LENGTH OF TRAINING

25,590 25,789 25,815 25,949 26,186 26,543 26,623 26,647 27,110

MOTIVATION

25,519 25,536 25,563 25,567 25,823 25,832 25,952 26,603 26,911 26,920

27,926

RETENTION

25,581 25,651 25,735 25,741 25,742 25,744 25,766 25,793 25,810 25,827

25,830 25,832 25,835 25,855 25,857 25,858 25,877 25,948 25,949 25,954

25,960 25,978 26,025 26,026 26,555 26,556 26,618 26,680 26,794 27,689

27,940 27,941 28,112 28,125

SET AND ATTENTION

25,662 25,713 25,726 25,832 25,954 26,554 26,622 26,639 26,680 26,687

27,007 27,108 27,323 27,378 27,384 27,938

THEORIES OF LEARNING

25,563 25,675 25,713 25,722 25,786 25,815 25,823 25,830 25,832 25,861

25,876 25,913 25,945 25,949 25,952 25,958 25,960 26,509 26,633 26,670

26,794 26,910 27,044 27,330 27,578 27,595 27,596 27,650 27,690

TRANSFER

25,567 25,632 25,641 25,757 25,786 25,789 26,022 26,034 26,110 26,165

26,171 26,544 26,553 26,807 27,110 27,983

WHOLE VS. PART

25,976 26,368

COMPARISON OF METHODS

25,890 26,054 26,056 26,292 26,364 26,366 26,368 26,532 26,577 26,586

26,618 26,637 26,795 26,878 27,080 27,784 28,020

EVALUATION OF PROGRAMS

26,044 26,047 26,176 26,365 26,394 26,578 26,715 26,911 26,988 27,244

27,842 27,876 27,877 28,104

GENERAL

26,007 26,048 26,367 26,914 27,078 27,217 27,609 27,640 27,851 27,876

TRAINING (CONT'D)

INSTRUCTOR BEHAVIOR

26,059 26,968 28,092

SPECIFIC TYPES

BASIC

26,371 26,911 27,144 27,876 27,877 28,106

FLIGHT

26,054 26,056 26,059 26,079 26,239 26,254 26,377 26,382 26,814 27,442  
27,983 27,984

GUNNERY AND MARKSMANSHIP

26,243

MAINTENANCE

25,841 26,006 26,394 26,722 26,882 26,883 27,674 27,675

OTHER

25,570 25,890 26,188 26,293 26,366 26,586 26,802 26,856 26,857 26,872  
26,914 26,965 26,968 27,240 27,533 27,556 27,648 27,670 27,683 27,684  
27,843 27,998 28,103

SONAR

26,134

SPACE

26,836

TRACKING AND MOTOR SKILLS

25,639 25,687 25,766 25,775 25,976 26,186 26,517 26,543 27,599 27,871

VOICE COMMUNICATION AND LANGUAGE

25,808 26,365 26,719 27,306 27,897 28,115

TRAINING AIDS AND DEVICES

AUDIO-VISUAL

26,010 26,259 26,724

AUDITORY

26,010

COMPUTERS

27,871

DISPLAY BOARDS AND OTHER GRAPHIC MATERIALS

26,795 26,877 26,878

FILMS

26,252 26,292

GENERAL

25,651 26,007 26,722 26,802 27,078 27,198 27,225 28,098

MANUALS

26,009 26,010 26,878 28,103

OTHER

26,378

SLIDES AND TRANSPARENCIES

26,292 26,878

TEACHING MACHINES

26,058 26,715 27,513

TELEVISION

25,648 26,021 26,260 26,321 26,791

TRAINERS AND SIMULATORS

25,841 26,081 26,393 27,964

TRANSLATING DEVICES

26,388 26,549 26,868 27,621 27,669

TRANSPORTATION SYSTEMS

26,482

UNDERWATERBREATHING APPARATUS

26,015 27,255 27,313 27,914 28,053

CLOTHING AND EQUIPMENT

26,015 26,205 26,423 27,255 27,318 28,053

OPERATIONAL EFFICIENCY25,723 26,015 26,205 26,244 26,423 26,766 27,099 27,310 27,313 27,317  
27,318 27,667 27,998 28,053OXYGEN AND PRESSURE REQUIREMENTS

26,766 26,955 27,255 27,313 27,914 27,915 28,053

VEHICLECONTROLS, DISPLAYS, AND INSTRUMENT PANEL DESIGN

26,268 26,320

DESIGN

26,312 26,313 27,175 27,517 27,566 27,567

GENERAL

26,781 26,829 27,175 27,525 27,565 27,568 27,979

HANDLING QUALITIES

26,301

LIGHTING SYSTEMS

26,320

VESTIBULAR FUNCTIONGENERAL25,588 25,677 26,074 26,091 26,107 26,114 26,258 26,712 26,760 26,820  
26,823 26,826 26,827 26,835 26,923 26,981 27,996VIBRATIONGENERAL25,516 25,884 25,927 25,931 26,113 26,736 26,839 26,959 26,960 27,554  
27,568 27,638 27,641 28,034WHOLE BODY25,884 26,192 26,227 26,526 26,688 26,779 26,781 26,829 26,832 26,833  
26,834 27,084 27,500 27,564 27,568 27,638 27,756 27,757 27,800 27,911VIGILANCE AND MONITORINGGENERAL

25,715 25,878 25,985 25,986 25,988 25,989 25,990 25,991 26,516 27,007

PERFORMANCE25,540 25,610 25,664 25,688 25,868 25,869 25,878 25,883 25,986 25,987  
25,988 25,989 26,035 26,078 26,228 26,522 26,525 26,611 26,629 26,673  
26,739 27,676 28,114THEORY

25,685 25,965 25,986 25,987 27,323

VISIONCOLOR VISION25,527 25,586 25,956 26,032 26,033 26,164 26,203 26,245 26,404 26,412  
26,413 26,415 26,418 26,427 26,428 26,433 26,443 26,450 26,451 26,452  
26,453 26,458 26,461 26,462 26,463 26,467 26,468 26,472 26,473 26,474  
26,607 27,032 27,035 27,041 27,333 27,337 27,809EFFECTS OF UNUSUAL ENVIRONMENTSACCELERATION

27,673 27,824

HIGH ALTITUDE

26,424 27,976

OTHER

25,526 25,807 25,820 25,880 26,015 26,205 26,692

VIBRATION

26,192 26,526 27,638

VISIONEFFECTS OF UNUSUAL ENVIRONMENT (CONT'D)ZERO "G"

27,951

EQUIPMENT AND METHODS

25,526	25,635	25,660	25,776	25,807	25,809	25,837	26,164	26,259	26,284
26,315	26,398	26,429	26,430	26,431	26,432	26,439	26,440	26,444	26,445
26,448	26,452	26,453	26,461	26,462	26,463	26,467	26,468	26,469	26,471
26,475	27,013	27,746							

GENERAL

25,807	25,969	26,459	26,614	28,032					
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ILLUMINATION LEVEL

25,522	25,672	25,791	25,803	26,032	26,033	26,183	26,292	26,427	26,428
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LOW LEVEL ILLUMINATION

26,292	26,295	26,456	27,105	27,668	27,833				
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PHYSIOLOGICAL MECHANISMS

25,635	25,808	25,809	25,837	25,864	25,969	26,052	26,202	26,337	26,399
26,426	26,442	26,447	26,642	27,008	27,013	27,073	27,089	27,090	27,092
27,093	27,094	27,096	27,100	27,283	27,585	27,863			

PSYCHOPHYSICAL SCALES

26,468	26,469	26,973	26,974	27,024	27,029	27,045			
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SIGNAL CHARACTERISTICS

25,613	25,642	25,674	25,700	25,721	25,747	25,751	25,771	25,803	25,871
25,885	25,971	25,991	26,295	26,298	26,433	26,443	26,469	27,032	27,280

TESTS

27,444

THEORIES

25,672	25,676	25,796	25,820	25,847	25,848	25,849	25,851	26,032	26,033
26,203	26,446	26,459	26,466	26,472					

VISUALACCOMODATION AND CONVERGENCE

26,455	26,600	26,605	26,641	27,039	27,976				
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ACUITYADAPTATION LEVEL

25,961	26,470	27,046							
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BRIGHTNESS CONTRAST

25,721	27,013	27,413							
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DYNAMIC

25,562	25,758	25,993	26,295	26,422	27,064	27,603			
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GENERAL

25,880	26,419	26,455	26,456	27,058	27,221	27,371			
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ILLUMINATION

25,522	26,032	26,033	26,037	26,803					
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ADAPTATION, PRE-ADAPTATION, AND PRE-EXPOSURE

25,617	25,847	26,046	26,275	26,295	26,414	26,441	26,449	26,450	26,470
26,472	26,524	26,787	27,103	27,104	27,324	27,833	27,838		

AFTEREFFECTS, AFTERIMAGES

25,571	25,587	25,595	25,602	25,628	25,673	25,706	25,740	25,964	26,410
26,622	26,623	26,624	27,021	27,026	27,032	27,040	27,069	27,076	27,098
27,324	27,333	27,838							

ANOMALIES AND INDIVIDUAL DIFFERENCES

25,808	25,809	25,970	26,218	26,257	26,455	26,456	26,954	27,087	27,088
27,101	27,102	27,211	27,281	27,327	27,336	27,371	27,432	27,475	27,510
27,699	28,022								

BRIGHTNESS DISCRIMINATION

25,538	25,679	25,791	25,796	25,878	26,162	26,402	26,409	26,418	26,435
26,438	26,441	26,449	26,460	26,506	26,630	26,681	26,974	27,003	27,013
27,049	27,091	27,413	27,585						

VISUAL (CONT'D)CODING

25,607 25,999 26,319 27,537

COMFORT AND FATIGUE

25,880 26,449

FIELDBINOCULAR

25,551 25,729 25,733 25,761 26,299 26,615 27,646

DISTORTED

25,617 25,847 27,324 27,838

MONOCULAR

25,616 25,761 26,665

PERIPHERAL

25,585 25,635 25,885 26,419 26,427 26,433 26,451 26,454 26,464 26,640

INFORMATION PROCESSING

25,608 25,721 25,744 25,760 25,761 25,871 25,881 25,964 25,969 25,971

25,995 25,999 26,162 26,300 26,598 26,609 26,644 26,663 26,672 26,685

MASKING AND INTERFERENCE

25,548 25,564 25,644 25,733 25,770 25,771 25,792 25,870 25,961 26,437

26,441 26,601 26,640 26,645 26,646 26,652 26,665 26,681 27,063

PERCEPTIONANGLE

25,578 25,596 25,620 25,621 25,633 25,752 25,785 25,848 25,849 25,963

26,250 26,266 26,835 27,933

DEPTH AND DISTANCE

25,537 25,571 25,596 25,616 25,653 25,665 25,676 25,729 25,752 25,791

25,799 25,843 25,848 25,849 25,851 25,859 25,860 25,885 26,244 26,256

26,299 26,313 26,396 26,405 26,408 26,519 27,016 27,037 27,039 27,042

27,048 27,058 27,068 27,529 27,643

FORM AND CONTOUR

25,557 25,564 25,578 25,584 25,601 25,671 25,700 25,721 25,729 25,739

25,752 25,755 25,770 25,771 25,794 25,800 25,837 25,843 25,847 25,873

25,881 25,959 25,972 26,298 26,519 26,580 26,631 26,632 26,658 26,664

26,682 27,282 27,050 27,064 27,077 27,333 27,698 27,699 26,961

MOVEMENT

25,518 25,525 25,587 25,595 25,622 25,623 25,667 25,689 25,706 25,719

25,726 25,740 25,850 25,859 25,959 25,995 27,037 27,051 27,055 27,332

27,512 27,533

NUMBER

25,761 26,300

PATTERN

25,531 25,578 25,584 25,601 25,624 25,642 25,648 25,671 25,694 25,700

25,719 25,747 25,751 25,794 25,803 25,808 25,837 25,863 25,871 25,958

26,166 26,455 26,677 27,013 27,591

SIZE

25,537 25,602 25,660 25,674 25,723 25,728 25,799 25,860 25,972 26,244

26,396 26,604 26,676 26,679 26,974 27,020 27,025 27,043 27,048 27,058

VELOCITY

25,646 25,959 26,610

REQUIREMENTS

25,820 25,981

SEARCH AND DETECTIONAIR TO AIR

26,267

AIR TO GROUND

26,000 26,021 26,086 26,199 26,725 27,060 27,061 27,062 27,534 27,570

27,604 28,121

GENERAL

26,166 26,221 26,298 26,580 27,178 27,288 27,937

VISUALSEARCH AND DETECTION (CONT'D)GROUND TO AIR

26,090

TARGET DETECTION

25,582	25,654	25,664	25,769	25,878	25,993	26,086	26,189	26,242	26,419
26,437	26,673	26,683	27,062	27,063	27,064	27,604	27,617	27,963	27,976

STANDARDS AND SPECIFICATIONS

26,397	26,429	26,430	26,431	26,432	26,434	26,444	26,445	26,452	26,453
26,458	26,461	26,462	26,463	26,467	26,468	26,473			

THRESHOLDS

25,522	25,627	25,672	25,708	25,747	25,776	25,961	25,990	26,039	26,245
26,298	26,407	26,433	26,437	26,438	26,441	26,442	26,446	26,460	26,464
26,466	27,009	27,288	27,339	27,642	27,968				

VTOL, STOL AIRCRAFT

26,314	26,732	26,889	26,894	26,898	26,899	26,931	27,798	27,799	27,801
27,803	27,804	27,872	27,874	28,105					

WARNING AND SIGNAL LIGHTS

26,847 27,287 27,440 27,860

WARNING DEVICES

25,634

WEAPONS SYSTEMS, DESIGN OFGENERAL

26,004 26,006 26,220 26,796 26,804 27,172 27,343 27,573 27,640 27,644

27,658 27,789 27,790

HANDHELD

26,046 26,223 27,678

INTERMEDIATE-SIZED

26,389 27,683

LARGE-SCALE

26,012 26,393 26,858 26,941 27,172 28,049

WEIGHTLESSNESS

26,207 26,219 26,283 26,342 26,344 26,345 26,346 26,347 26,349 26,352

26,353 26,752 26,760 26,766 26,773 26,797 26,817 26,824 26,825 26,918

27,266 27,316 27,401 27,413 27,422 27,428 27,429 27,478 27,489 27,496

27,501 27,502 27,549 27,849 27,951

WINDSHIELDS

27,973

WORK AND TASK PERFORMANCEACCURACY AND SPEED REQUIREMENTS

25,573 26,530 26,554 26,585

CAPACITY FOR PRODUCTION

26,190 26,534 27,721

COMPLEXITY

25,544 25,600 25,657 25,687 25,991 25,994 26,020 26,030 26,035 26,078

26,172 26,425 26,540 26,541 26,584 27,160 27,165 27,526 27,820 27,919

27,920

FATIGUE AND BEHAVIOR DECREMENT

25,612 25,685 25,686 25,759 25,823 25,926 26,183 26,534 26,540 26,626

26,819 27,109 27,153 27,154 27,190 27,439 27,441 27,444 27,506 27,527

27,981 27,988

GENERAL

25,519 26,178 26,187 26,678 27,662

LENGTH AND DISTRIBUTION OF WORK AND REST PERIODS

27,253 27,416 27,506

METHOD OF STUDY AND MEASUREMENT

25,576 25,681 26,173 26,175 26,487 26,516 27,784

PHYSIOLOGICAL MEASURES

25,540 25,605 25,611 25,612 25,818 27,154 27,700 27,701 27,737 27,738

27,747 27,753 27,778 27,921

WORK PLACE DESIGNAREA REQUIREMENTS

26,230 26,231 26,359 26,844 27,347 27,653

ATMOSPHERIC CONTROL

26,947 26,953 26,970 27,251 27,884

ILLUMINATIONFACTORY, OFFICE, AND HOME

27,344

GENERAL

26,183

OTHER FACILITIES REQUIRING SPECIAL LIGHTING CONDITIONS

26,721 27,524

SEATING ARRANGEMENTS

26,515

25,515

Wolff, B.B., Krasnegor, N.A. & Farr, Roberta S. EFFECT OF SUGGESTION UPON EXPERIMENTAL PAIN RESPONSE PARAMETERS. Percept. mot. Skills, Dec. 1965, 21(3), 675-683. (New York University Medical Center, New York, N.Y.).

The differential effects of permissive and non-permissive instructions upon pain threshold and pain tolerance were studied in 43 healthy human Ss, using cutaneous electrical stimulation. Pain was induced by a Grass Model S4 stimulator, set at 150 volts and 60 cps. For each trial mean detection threshold and mean pain threshold were calculated from ascending and descending pain thresholds. t-tests were applied to the mean scores on permissive and non-permissive trials. Non-permissive instructions resulted in very significant increases in both pain tolerance and pain sensitivity range, but no significant changes were observed for both pain threshold and detection threshold. Therefore, Gelfand's hypothesis, stating that pain threshold and pain tolerance have differential loadings of physiological and psychological components, was supported. It was also found that the left or non-dominant hand was consistently more sensitive to pain than the right hand. This result is consistent with Wolff's & Jarvik's suggestion that lateral dominance is important in pain perception.

R 13

25,516

Hahn, J.F. UNIDIMENSIONAL COMPENSATORY TRACKING WITH A VIBROTACTILE DISPLAY. Percept. mot. Skills, Dec. 1965, 21(3), 699-702. (University of Virginia, Charlottesville, Va.).

Accuracy of unidimensional compensatory tracking was compared for a visual and a vibrotactile display. 5 Ss tracked with vibrotactile display, 5 Ss with the visual display. 4 different tracking speeds were employed. An analysis of variance yielded significant results. Error was 2 1/2 times greater with the vibrotactile display which was estimated to have a gain 1/5 that of the visual display. Equalizing the gains would be expected to make the dynamic range of the vibrotactile display considerably smaller than that of the visual display.

R 4

25,517

Trumbo, D., Noble, M. & Baganoff, F. ANALOG COMPUTER METHODS FOR SCORING CONTINUOUS PERFORMANCE RECORDS. Percept. mot. Skills, Dec. 1965, 21(3), 707-714. (Kansas State University, Manhattan, Kan.).

Methods for scoring continuous records of tracking performance with analog signal correlator and frequency analysis systems are described. An index of lead-lag obtained from the correlator output is compared with discrete lead-lag scores obtained by hand-scoring oscillographic records for 3 tasks which differ in amount of task coherence. The results indicate relatively high agreement between the 2 scoring methods and support the use of the correlator as the more efficient method. Sample data from the analog frequency analysis system are compared for operators with high and low integrated error scores. The results indicate consistently greater power in the response than in the input at the fundamental for both good and poor Ss, indicating a tendency to overshoot the target with the primary movement, but relatively more power in the initial odd harmonics for the better Ss. Ratios of target spectra to response spectra provide transfer functions for the human operator.

R 6

25,518

Gilbert, Doris C., Hahn, Judy P., Wachwitz, J.H. & Martin, R.M. STABILITY OF AUTOKINETIC MOVEMENT. Percept. mot. Skills, Dec. 1965, 21(3), 715-718. (University of Denver, Denver, Colo.).

Experimental investigation into the relationship between the autokinetic illusion and personality factors requires greater knowledge of the generality of the various findings on individual differences. The stability of autokinetic movement was investigated by varying several conditions: instructional set (accuracy vs illusion), light source (stationary vs moving), sex of E, number and length of trials, re-test time interval. 50 female Ss were asked to draw what they saw in a 10 min. exposure to a pinpoint of light under various conditions and at various times. Results for female college Ss lend support to the hypothesis that 1 dimension of apparent movement, length of line, is a stable individual characteristic.

R 15

25,519

Locke, E.A. INTERACTION OF ABILITY AND MOTIVATION IN PERFORMANCE. Percept. mot. Skills, Dec. 1965, 21(3), 719-725. (American Institutes for Research, Washington, D.C.).

4 studies are reported which attempted to replicate previous findings of significant interactions between ability and motivation in performance. In general, the previous findings were not strongly replicated, though there was some evidence that the effects of motivation on High Ability Ss are relatively greater than on Low Ability Ss. However, several significant motivation and ability effects were found for both Low Ability and Low Motivation Ss, respectively.

R 7

25,520

Brown, D.E. & Hitchcock, L., Jr. TIME ESTIMATION: DEPENDENCE AND INDEPENDENCE OF MODALITY-SPECIFIC EFFECTS. Percept. mot. Skills, Dec. 1965, 21(3), 727-734. (Purdue University, Lafayette, Ind. & Johnsville, Penn.).

This study was designed to extend the conditions under which time estimation has been studied, using the method of reproduction. 80 Ss were required to reproduce 9 time intervals, ranging from 1 to 17 sec. duration, under 8 experimental conditions: the factorial arrangement of auditory and visual interval presentation, auditory and visual interval reproduction and patterned and unpatterned stimulus filling the interval. Mean durations of reproductions were computed, and subjected to analysis of variance. Mode of stimulus presentation and of reproduction had no consistent effect on time estimation. Significant modifications occurred with repeated trials and reliabilities of duration estimations were consistently high. (HEIAS)

R 11



25,521

Wells, H. STIMULUS COMPOUNDING AND THE ATTAINMENT OF CONJUNCTIVE AND DISJUNCTIVE CONCEPTS. Percept. mot. Skills, Dec. 1965, 21(3), 767-770. (University of Washington, Seattle, Wash.).

Stimulus patterning was found to have a differential effect on the ease with which human Ss attained conjunctive and disjunctive concepts. 24 undergraduate Ss were given 8 disjunctive training problems and tested on a choice problem for which both conjunctive and disjunctive solutions were possible. On the test problem, more conjunctive solutions were offered when the stimulus dimensions were contained in a single geometric stimulus. More disjunctive solutions were offered when the dimensions were spatially separated on each instance. The former instances were assumed to allow for more stimulus patterning than the latter. It was concluded that stimulus patterning imposes a limiting condition on the efficacy of disjunctive-concept training, when tested by transfer on a choice problem for which a conjunctive solution is also possible.

R 6

25,522

Torii, S. & Uemura, Y. EFFECTS OF INDUCING LUMINANCE AND AREA ON TEST-THRESHOLD LUMINANCE. Percept. mot. Skills, Dec. 1965, 21(3), 779-782. (University of Tokyo, Tokyo, Japan.).

This experiment measured test-threshold luminance as a function of inducing-field luminance, using a disc-shaped test field completely surrounded by a contiguous annular inducing field, and also by varying the area of the inducing-field, for differences in inducing area may be related to increase in the test-threshold luminance. 2 well-trained Ss dark-adapted for 20 min. and then viewed a stimulus pattern and light-adapted for 3 min. The threshold luminances were computed for each S. Results showed that threshold luminance of a disc-shaped test-field increased with increase in the inducing luminance and was slightly altered by larger areas of the inducing field. (HEIAS)

R 2

25,523

Gescheider, G.A. & Wright, J.H. EFFECTS OF BODY POSITION ON JUDGMENT OF THE POSTURAL VERTICAL. Percept. mot. Skills, Dec. 1965, 21(3), 783-786. (Hamilton College, Clinton, N.Y. & Wake Forest College, Winston-Salem, N.C.).

The experiment sought to determine whether body position itself might be a factor influencing postural judgments. Each of 60 male Ss made 20 judgments of the postural vertical in the absence of visual cues. 10 Ss were randomly assigned to each of the 6 experimental conditions defined by left or right lateral tilt in a prone, supine, or sitting body position. In all conditions Ss consistently underestimated the postural vertical. Significantly larger errors were made by Ss tilted in the sitting position than by Ss tilted in the prone or supine positions. Performance in the prone and supine positions did not differ. No differences were obtained between tilting in the left and right quadrants for any of the body positions. Practice led to a significant decrease in error under all conditions.

R 12

25,524

Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXIII. PSYCHOLOGICAL INDEX NO.19 1912. Percept. mot. Skills, Dec. 1965, 21(3), 787-790. (University of Montana, Missoula, Mont.).

An alphabetical index of 92 references to work in perception and closely related fields is presented containing articles from 1912. (HEIAS)

25,525

Stanley, G. EFFECT OF A FRAME ON AUTOKINETIC MOVEMENT INDUCED BY OCULOMOTOR STRAIN. Percept. mot. Skills, Dec. 1965, 21(3), p798. (Indiana University, Bloomington, Ind.).

The prediction was tested that after induced strain, autokinetic movement should be reduced or occur very little in the presence of a frame-of-reference. 10 Ss took part in the study. The apparatus was that used by Gregory & Zangwill (1963) and instructions were similar except that Ss made estimates in in. of the distance travelled. Mean extent of movement in in.: a) light alone: 18.5 $\pm$ 2.1; b) light and frame 4.6 $\pm$ 0.2; c) light after induced strain to the left: 22.1 $\pm$ 3.4; d) light after induced strain to the right: 24.1 $\pm$ 2.7; e) light and frame after induced strain to left: 3.6 $\pm$ 0.3; f) light and frame after induced strain to right: 2.1 $\pm$ 0.2. Conditions b, e, & f resulted in a marked and significant reduction in autokinetic movement. For the last 2 conditions 7 Ss reported no movement at all. It appears that the autokinetic movement produced by oculomotor strain behaves in a similar way to the classic effect. (HEIAS)

R 4

25,526

Williams, L.G. & Wallen, D.J. GENERALIZING FROM THE CORNEAL REFLECTION TECHNIQUE: A METHODOLOGICAL STUDY. Percept. mot. Skills, Dec. 1965, 21(3), 807-810. (Honeywell Systems & Research Division, St. Paul, Minn.).

The study objective was to determine how the occlusion of 1 eye and the restraint of head movement, restrictions commonly imposed when measuring eye movements by corneal reflection, affected the performance of a perceptual task. The search field consisted of 100 colored forms, each containing an identifying 2-digit number. Each form was 1 of 5 shapes, 1 of 4 areas and 1 of 5 colors. The fields were displayed on a 48 in. square rear projection screen 68 in. in front of S, with its center at eye level. 12 Ss were run under each of 4 conditions. The times required to locate the target were recorded to the nearest 0.5 sec. ANOVA was performed.

R 1

25,527

Cavonius, C.R. COLOR SENSITIVE RESPONSES IN THE HUMAN FLICKER - ERG. Docum. Ophthalmol., ca. 1965, XVIII, 101-113. (Psychology Dept., Brown University, Providence, R.I.). (Reprint) (AD 621722)

Studies which have attempted to measure selective chromatic adaptation in the human ERG have demonstrated that although it is relatively simple to selectively depress either the photopic or the scotopic component, selective effects within the photopic system are very slight. The study to be described confirms these findings. The human photopic ERG was elicited by rapidly flickering monochromatic stimuli which were presented while the eye was exposed to steady monochromatic adapting fields. Computer averaging was employed to measure the resulting weak responses. Chromatic adaptation was found to depress responses to stimuli of all wavelengths about equally, although slight but reproducible selective effects occurred. These selective effects consisted of a greater depression in the amplitude of responses elicited by stimuli of wavelengths close to that of the adapting field. These selective effects were very small, and were equivalent to the decrease in response amplitude which could be produced by lowering stimulus intensity by a few hundredths of a log unit. Some of the implications of these findings are considered in terms of color theory.

R 22

25,528

Teichner, W.H., Christ, R.E. & Fergenson, E. EFFECTS OF TARGET VALUE AND THE INTERACTION OF SHORT- AND LONG-TERM MEMORIES ON HUMAN INFORMATION PROCESSING. Contract Nonr 3357(06), Proj. NR 196 043/6 26 64, Rep. 1, Sept. 1965, 100pp. USN Engineering Psychology Branch, ONR Washington, D.C. (University of Massachusetts, Amherst, Mass.). (AD 471915)

6 major experiments were conducted to examine the effects of target value upon the reporting of briefly exposed symbolic data and to consider the interaction of this variable with a proposed interaction between short- and long-term memory. The accuracy of reporting the high-valued stimuli was, in general, superior to that of the low-valued stimuli but this relationship appeared to depend upon the method of payoff employed. It was also found that as the number of values exceeded two, there were decreasing levels of accuracy. It was concluded that completely unfamiliar, non-naturally sequenced stimuli would have to be used to successfully investigate the relationship between short- and long-term memory.

R 41

25,529

Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XXIV, PSYCHOLOGICAL INDEX NO. 20, 1913. Percept. mot. Skills, Dec. 1965, 21(3), 823-826. (University of Montana, Missoula, Mont.).

96 articles and books dealing with perception and closely related fields are listed alphabetically (all from the year 1913). (HEIAS)

25,530

Greer, F.L. USER VOCABULARY IN THESAURUS DEVELOPMENT. Percept. mot. Skills, Dec. 1965, 21(3), 827-837. (Special Operations Research Office, American University, Washington, D.C.).

A multistep model called the User Approach Model is proposed as an aid for determining terms to be used in an indexing thesaurus. Information problems and questions are used to derive words which are directly related: a) to a user's potential need for information; and b) to the spontaneous language in which a user expresses his request. Search words identified by a User Approach could provide specifications for human indexers as well as for electronic equipment fed by character readers. A User Approach is designed to maximize the probability that words in storage will be matched by the words of system users. The contention is that information system designers should more explicitly build on the actual language inclinations of system users. Empirical comparisons of effectiveness and cost should be made for the indexing products of variants of the User Approach and for the current Expert and Statistical approaches to indexing.

R 11

25,531

Harcum, E.R. & Skrzypek, G. CONFIGURATION DETERMINANTS IN VISUAL PERCEPTION ON BINARY PATTERNS: SUPPLEMENTARY REPORT. Percept. mot. Skills, Dec. 1965, 21(3), 860-862. (College of William & Mary, Williamsburg, Va.).

The study was designed to test the hypothesis that variables which change the perceived configuration of the stimulus pattern alter the distribution of errors. 4 stimulus configurations were used. 20 binary patterns of 4 blackened and 4 open elements were each exposed for .1 sec. to each of 8 Ss, for a total of 4 times under each condition in random sequence. This study corroborates and extends an earlier conclusion that the discriminability of elements within tachistoscopic patterns was determined by an organizational process of memory, rather than by visual sensitivity per se. Since the distribution of errors among elements of a tachistoscopic pattern was affected by configuration changes in the spacing of the stimulus-elements, authors concluded that the role of mnemonic organizing processes had been demonstrated.

R 3

25,532

Weber, D.S. A TIME PERCEPTION TASK. Percept. mot. Skills, Dec. 1965, 21(3), 863-866. (US Veterans Administration Hospital, Tucson, Ariz.).

This paper describes the use of a novel method and apparatus for the study of time perception. This method of concurrent comparisons requires temporal discrimination among visual signals in the absence of appropriate exteroceptive cues. 72 Ss were asked to identify from a panel of 9 flashing lights the 1 light containing interflash intervals of fixed duration. 3 intervals under 1.0 sec. were used. A score for each S was obtained by counting the number of correct identifications of the bulb with fixed intervals between flashes. ANOVA was performed. Sex differences and feedback were significant variables. Duration of interval, use of rhythm or kinesthetic cues, and practice had little effect on performance.

R 7

25,533

Pitz, G.F. RESPONSE VARIABLES IN THE ESTIMATION OF RELATIVE FREQUENCY. Percept. mot. Skills, Dec. 1965, 21(3), 867-873. (Southern Illinois University, Carbondale, Ill.).

6 groups of 20 Ss each observed a sequential series of digits, 4s & 8s, and judged what proportion (P) of the total was made up by 1 of the digits. 3 kinds of response were used, estimates of percentage, the ratio of 1 frequency to the other, and the 2 frequencies themselves. P was varied from .1 to .9, either by holding total frequency constant, or by holding 1 frequency constant and varying the second. All responses were converted to log ratios, and the relationship of log estimated ratio to log ratio was found to be generally linear. There were significant differences in scales of proportion for the 3 response modes, and for the 2 methods of P variation. Percentages, ratios and frequencies gave different slopes, which were possibly a function of an assimilation-contrast effect. Differences due to methods of P variation were thought to result primarily from differences in total frequency at certain levels of P.

R 6

25,534

Mackie, J.B. & Beck, E.C. RELATIONS AMONG AGE, INTELLIGENCE AND CRITICAL FLICKER FUSION. Percept. mot. Skills, Dec. 1965, 21(3), 875-878. (University of Maryland, College Park, Md. & University of Utah College of Medicine, Salt Lake City, Utah.).

This study was designed to investigate relations among age, intelligence, and cff in 29 brain-damaged and 29 normal Ss. The WAIS was administered by trained personnel. The cff apparatus consisted of a square wave generator driving a glow modulator lamp. Frequencies ranged from 1 to 60. The mean cff for the brain-damaged group was 24.14 cps, the normal group's mean was 29.67. Results indicate no significant relationships among age, intelligence, and cff in the normal group. Within the brain-damaged group cff was significantly related to verbal intelligence. (HEIAS)

R 10

25,535

Thor, D.H. & Baldwin, R.O. TIME OF DAY ESTIMATES AT SIX TIMES OF DAY UNDER NORMAL CONDITIONS. Percept. mot. Skills, Dec. 1965, 21(3), 904-906. (Western Michigan University, Kalamazoo, Mich.).

75 adults were asked to estimate the correct time of day without reference to clocks at each of 6 times of day from 8:00 A.M. to 8:00 P.M. Significant group mean differences were found, with underestimation of correct time at mid-day and overestimation at early (8:00-10:00 A.M.) and later (6:00-8:00 P.M.) times of day.

R 12

25,536

Toppen, J.T. MONEY REINFORCEMENT AND HUMAN OPERANT (WORK) BEHAVIOR: III. PIECEWORK-PAYMENT COMPARISONS. Percept. mot. Skills, Dec. 1965, 21(3), 907-913. (University of Cincinnati, Cincinnati, Ohio).

2 groups of 10 college male Ss were given different money reinforcement schedules in single 1-hr. work periods for each S (following a combination of "pretests" and a questionnaire, used for reasons described). The work was that of repetitively pulling a manipulandum against a constant-tension spring requiring 25 lb. of force, horizontally, through 5/8-in. distance. The control group was paid at a rate of 10¢ for each 1000 pulls. The test Ss were paid in advance with instructions that they had the job of working at the machine for 1 hr., if they wished (though they were required to remain in the room) and were given the maximum rate of pay (\$1.50 per hr.) which it was anticipated the control Ss might earn. The test Ss were told that their work "may provide information on which to base later studies." As predicted, the control Ss showed markedly greater output (approximately 100% greater) than that obtained from Ss paid in advance, on a time basis.

R 5

25,537

Baird, J.C. STIMULUS AND RESPONSE FACTORS IN SIZE INSTRUCTION EFFECTS. Percept. mot. Skills, Dec. 1965, 21(3), 915-924. (Associates for Research in Behavior, Philadelphia, Penn.).

In 2 experiments Os adjusted the size of a neat comparison stimulus to match the size of a distant standard. Different instructions, psychophysical methods, and stimulus figures were used. In the first experiment 72 Ss were randomly assigned to 6 equal groups differing in initial and subsequent size instructions. In the second experiment 40 Ss were divided into 4 groups. The general results agreed with previous instruction effects but also suggested that such estimates depend upon the isolated and concordant influence of several stimulus and response factors.

R 18

25,538

Warren, R.M. LIGHTNESS OF GRAY IN THE PRESENCE OF WHITE. Percept. mot. Skills, Dec. 1965, 21(3), 925-926. (University of Wisconsin-Milwaukee, Milwaukee, Wisc.).

The experiment was designed to study the contrast between white and gray by determining lightness judgments for a large gray sheet with a small white patch at its center. 30 Ss took part. The empirical evidence thus far indicates that the square root rule applied for first lightness judgments of a middle gray by naive Ss when viewing either: a) contiguous symmetrically displayed white and gray fields; or b) a white patch surrounded by gray; but not when c) the gray is seen as a patch against a white background.

R 4

25,539

Coules, J., Avery, D.L. & Meskil, A. INFORMATION TRANSMISSION IN A PATTERN DISCRIMINATION TASK AS A FUNCTION OF INITIAL TASK DIFFICULTY. Percept. mot. Skills, Dec. 1965, 21(3), 927-939. (USAF Decision Sciences Lab., Hanscom AFB, Mass.).

Information transmission measures were obtained with the method of absolute judgments and learning effects were evaluated as the nature of the discrimination task varied. 2 experiments were conducted using regular and irregular geometric forms which were tilted in various degrees from the line of sight. In Exp. I, the judgment task increased in difficulty from large to fine differences in tilt, whereas in Exp. II the discrimination task was difficult throughout the experiment. In both experiments the task increased in difficulty because stimulus uncertainty increased. Results showed that when the demands of the task are such that early and sustained high performance is required, it is better if the Os are presented with the difficult task from the start rather than gradually increase its difficulty. Geometric forms showed significant differences in the amount of information transmitted.

R 18

25,540

Eason, R.G., Beardshall, Ann & Jaffee, S. PERFORMANCE AND PHYSIOLOGICAL INDICANTS OF ACTIVATION IN A VIGILANCE SITUATION. Percept. mot. Skills, Feb. 1965, 20(1), 3-13. (San Diego State College, San Diego, Calif. & USN Electronics Lab., San Diego, Calif.).

Changes in performance and in 4 physiological measures during the course of a 1 hr. vigil and as a function of signal presentation rate were studied. Based on data obtained from 6 Ss during a total of 24 vigils, performance (% correct detections) and skin conductance decreased during the course of a vigil, heart rate remained constant, and neck tension level increased. There was no consistent tendency for Ss to perform at a higher level when signals were presented at a relatively fast rate than when presented at a slower rate. However, their performance was differentially affected by presentation rate, some performing better during the fast rate, some during the slow rate, and others showing no change. A positive relationship was found between the relative performance level manifested during the 2 rates (fast rate expressed relative to slow) and the relative magnitudes of skin conductance, heart rate, and neck tension level. The results were interpreted as supporting the hypothesis that variations in vigilance performance are in part determined by changes in activation level. The feasibility of recording physiological information in order to ascertain more accurately which factors are contributing to variations in performance in a given vigilance situation seems to have been demonstrated.

R 17

25,541

Oyama, T. & Akatsuka, R. EFFECT OF COLOR-SIMILARITY ON THE SIZE-ILLUSION OF TRIPLE CIRCLES. Percept. mot. Skills, Feb. 1965, 20(1), p14. (Hokkaido University, Sapporo, Japan).

It has been shown that the size-illusion of a double circle is not affected by the similarity in color of the 2 circles. The present study re-examined this problem for triple circles. Munsell-type colored papers were pasted on a white card to form the standard stimuli, their diameters were 90, 60, & 30 mm and the width of their outlines was 2 mm. 10 different color-combinations were used. The comparison stimuli were a series of outline circles drawn in India Ink on white cards, with diameters varying in 1 mm steps from 48 to 72 mm. 6 Ss were instructed to compare binocularly the middle circle of the standard stimulus with the comparison stimulus. The method of limits was used. An analysis of variance showed that the middle circle appeared equal in size whether it was the same color as the outer circle or as the inner circle, and suggests that this illusion has little relation to perceptual grouping for which similarity is very important. Control experiments showed that the middle circle of 3 concentric circles of the given size-ratios generally appears larger than a single circle of the same physical size probably because the enlarging toward overestimation effect of the outer circles is stronger than the shrinking effect of the inner circle.

(HEIAS)

R 2

25,542

Nickerson, R.S. RESPONSE TIMES FOR "SAME"- "DIFFERENT" JUDGMENTS. Percept. mot. Skills, Feb., 1965, 20(1), 15-18. (USAF Decision Sciences Lab., Hanscom AFB, Mass.).

In this reaction time (RT) experiment S's task on each trial was to decide whether or not the second of 2 English consonants displayed sequentially on a cathode ray tube, was the same as the first and to signify his decision as quickly as possible by pressing 1 of 2 response keys. On half of the 64 trials of each run the second letter was the same as the first; on the other half it was randomly selected from the remaining 15 of 16 originally chosen consonants. 4 female college students each had 1 run for each of 22 days. Responses indicating that the second letter of a pair was different tended to have longer RTs ( $p < .01$  sign test). The mean difference between the 2 types of RT was 45 msec. 20 additional Ss were each given 1 64-trial run with the same task. For 19 of the 20, mean RT was longer for "different" responses. Mean difference was 80 msec. The experiment raises the question whether the finding represents a basic characteristic of recognition or discrimination processes, or merely reflects a bias in the way in which S verbalizes the task. (HEIAS)

25,543

Morgan, R.F. & Bakan, P. SENSORY DEPRIVATION HALLUCINATIONS AND OTHER SLEEP BEHAVIOR AS A FUNCTION OF POSITION, METHOD OF REPORT AND ANXIETY. Percept. mot. Skills, Feb. 1965, 20(1), 19-25. (Michigan State University, East Lansing, Mich.).

36 college students individually experienced an hour of sensory deprivation while immobile and wearing translucent goggles. Half the sample spent the hour lying down in a horizontal position; half sitting up. 12 Ss were randomly assigned to each of 3 report methods: continuous, voluntary, and silent. Anxiety and other S-characteristics were recorded. Sensory deprivation hallucinations (SDH) occurred significantly more often in the horizontal position. Reported sleeping decreased significantly with higher anxiety and continuous reporting. Report method, anxiety, intelligence, sex, daydreaming, and non-SDH visual imagery were not significantly related to SDH occurrence or vividness. Effects of horizontal position were interpreted as due to stimulus generalization from sleep. The horizontal position, analogous to the sleeping position, elicited SDH which conceivably may be analogous to dreams.

R 15

25,544

Kennedy, W.A. & Willcutt, H.C. AN EIGHT-DIFFICULTY-LEVEL DISCRIMINATION PROBLEM. Percept. mot. Skills, Feb. 1965, 20(1), p26. (Florida State University, Tallahassee, Fla.).

The present report demonstrates that difficulty levels established on a theoretical basis for an oddity discrimination problem were confirmed empirically when the difficulty criterion was S's RT latency between the presentation of the stimulus card and correct discrimination. 4 designs, 1 of which was different from the other 3, were presented on each of 32 stimulus cards. There were 8 levels of difficulty, defined in terms of the distribution of 32 black squares on a 64-square black and white checkerboard. Each card was exposed through an illuminated window in a discrimination box. All 32 cards were administered to 720 Negro and White children at grade levels 2, 4, 7, & 10, under various incentive conditions. Mean latency RT values suggest a nearly linear relation of RT over difficulty levels. (HEIAS)

R 2

25,545

Bell, R.W. & Jamison, Nancy. EFFECTS OF VALUE OF REINFORCEMENT UPON EXPECTANCY STATEMENTS IN "GAMBLING" AND ACHIEVEMENT TASKS. Percept. mot. Skills, Feb. 1965, 20(1), 27-32. (Northern Illinois University, DeKalb, Ill.).

The effects of probability of reinforcement and reward value on expectancy of success were investigated in both learning and gambling tasks. 48 college students were asked to predict their success rate in correctly anticipating which of 4 lights would next be turned on. For some Ss the pattern of lights was random. For others a systematic pattern was repeated, permitting learning. 6 groups of 6 Ss each were assigned to the gambling task with 3 levels of objective probability of reinforcement and 2 levels of reinforcement value. 2 groups of 6 Ss each were assigned to the achievement task, 1 for each level of reinforcement value. Statements of expected success for each block of 10 trials were obtained immediately after the completion of the preceding block of trials. An analysis of variance was carried out. Different probabilities of reinforcement effectively varied the level of expectancy, as did the gradual learning of the pattern in the learning task. Amount of reward, using poker chips with cash value, did not significantly alter expectancies of success in either the learning or gambling (random pattern) task. The implications of the results for expectancy theories were discussed.

R 12

25,546

Wright, Nancy A. & Abbey, D.S. PERCEPTUAL DEPRIVATION TOLERANCE AND ADEQUACY OF DEFENSES. Percept. mot. Skills, Feb. 1965, 20(1), 35-38. (University of Manitoba, Manitoba, Winnipeg, Canada).

The purpose of the study was to determine whether the Rorschach test could serve as a useful predictor of perceptual deprivation tolerance. The Ss were a group of 21 male students who had participated in perceptual deprivation studies before. 14 Ss had remained in isolation for the prescribed period of 1 wk., while 7 terminated the condition within the first 3 days. Several months later the Buhler-Lefever Standardization of the Rorschach was administered. All protocols were scored according to the Holt-Havel method for assessing primary and secondary processes yielding 2 scores: a) Defense Demand; and b) Effectiveness of Defense. An Index of Control was derived for each S which was equivalent to the proportion of Defense Demand to Effectiveness of Defense. The 21 Ss were grouped into High-, Mid-, and Low-control Groups. A chi square analysis demonstrated that the effectiveness of Ss' control and defense mechanisms was related to success or failure in isolation. Failure to tolerate isolation is closely related to a low Index of Control. (HEIAS)

R 18

25,547

Alluisi, E.A., Morgan, B.B., Jr. & Hawkes, G.R. MASKING OF CUTANEOUS SENSATIONS IN MULTIPLE STIMULUS PRESENTATIONS. Percept. mot. Skills, Feb. 1965, 20(1), 39-45. (University of Louisville, Louisville, Ky.).

10 Ss made absolute judgments of electrocutaneous stimuli consisting of from 1 to 3 simultaneous stimulations of 6 loci. There were 3 loci in symmetrical positions on either side of A's body--1 on each shoulder blade, 1 on each arm between the elbow and the shoulder, and 1 on each side of the body just above the belt line. Each S responded with 1 of 2 response alphabets during 11 sessions of 41 trials each, over a period of 3 days. Differences between the 2 response alphabets were not significant, and neither were differences attributable to the interaction of the response alphabets with the number of loci stimulated. Increases in the percentages of erroneous responses with increases in the number of loci stimulated were both large and statistically significant; these increases were interpreted as evidence of a central mechanism of cutaneous masking.

R 13

25,548

Schiller, P.H. BACKWARD MASKING FOR LETTERS. Percept. mot. Skills, Feb. 1965, 20(1), 47-50. (Massachusetts Institute of Technology, Cambridge, Mass.).

This study investigated extent of backward masking for letters under conditions where test stimulus and masking stimulus were the same or different. 2 response measures were used, detection of location and identification of the test stimulus. The masking stimulus was a group of 4 letters drawn on a white card. The test stimuli were 16 cards, each carrying 1 of the 4 test letters. 4 different test durations were employed: 30, 40, 50, & 60 msec. The interval between the test and masking stimuli was constant at 3 msec. and the duration of the masking stimulus was 100 msec. A total of 80 measurements were obtained over a period of 10 days for each of 9 testing conditions. The data were obtained from 1 S, but a second S, tested later, provided similar results. For test letters that differed from the masking letter, masking effects were maximal when S's task was to identify the letter; minimal when S indicated the position of the test letter. When the test and masking letters were identical, the extent of masking was the same with both response measures. The results suggest that: a) different response measures provide different estimates of interference; and b) the degree to which response measures differ is a function of the types of stimuli employed. (HEIAS)

R 3

25,549

Sampson, P.B. & Elkin, E.H. LEVEL OF DISPLAY INTEGRATION IN COMPENSATORY TRACKING. Percept. mot. Skills, Feb. 1965, 20(1), 59-62. (Tufts University, Medford, Mass.).

4 male Ss performed compensatory tracking for 20, 2 min. trials on each of 4 displays differing in the degree of integration of 2 input signals and in the presence or absence of a secondary interference task with each display. The order of superiority of the displays was consistent with their level of integration, with the most highly integrated display yielding the best performance. The interference task lowered performance on each display, but an expected interaction between display integration and interference task did not prove to be significant. The results failed to support the notion that performance with the best integrated displays would be less affected by distraction tasks than would performance with the poorly integrated displays.

R 4

25,550

Freeman, I. & Adams, June. SIZE-WEIGHT ILLUSION AND ANCHORING OF WEIGHT JUDGMENTS. Percept. mot. Skills, Feb. 1965, 20(1), 63-68. (University of Alberta, Edmonton, Alberta, Canada).

The study was designed to investigate the effect of the size-weight illusion upon absolute judgments of weights, the illusion being introduced by decreasing the size of an anchor much heavier than the judged stimuli. 20 Ss were divided into 2 equal groups: the Illusion Group was presented with the small anchor, the No Illusion Group used the anchor of the same size as the stimulus series. It was found that the introduction of the size-weight illusion did not affect the magnitude of the judgment shifts induced. The conclusion is that there is at least a limitation on the operation of the size-weight illusion through a remote anchor in an absolute judgment situation. (HEIAS)

R 4

25,551

Hodges, W.F. & Fox, R. EFFECT OF AROUSAL AND INTELLIGENCE ON BINOCULAR RIVALRY RATE. Percept. mot. Skills, Feb. 1965, 20(1), 71-75. (Vanderbilt University, Nashville, Tenn.).

Variation in rate of binocular rivalry alternation was measured in 40 undergraduate males as a function of physiological arousal induced by threat of shock and as a function of differences in verbal intelligence. A wheatstone-type stereoscope was employed. A complete stimulus field consisted of a colored target seen as figure against the ground of vertical black-white stripes. Ss reported rivalry changes by means of a switch connected to an event recorder. Heart rate was measured by a fingertip photocell plethysmograph. Electric shocks were delivered to the ankles of experimental Ss via zinc electrodes. Control and experimental groups were formed of equal numbers of high and low intelligence Ss; both groups observed rivalry for a total of 8 min. Rivalry rates were computed by recording the number of times S reported a shift from 1 color to the other during a 2 min. session. The effects of intelligence, experimental conditions and interactions are not significant. For all Ss rivalry rate increased significantly over trials ( $F=9.40$ ,  $p<.01$ ). (HEIAS)

R 8

25,552

Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XVII. PSYCHOLOGICAL INDEX. NO.13 1906. Percept. mot. Skills, Feb. 1965, 20(1), 96-98. (Montana State University, Bozeman, Mont.).

This list of 74 items were selected from the 17th Psychological Index as the articles relevant to perceptual problems. (HEIAS)

25,553

Schappe, R.H. MOTION ELEMENT SYNTHESSES--AN ASSESSMENT. Percept. mot. Skills, Feb. 1965, 20(1), 103-106. (Ohio University, Athens, Ohio).

An element of motion cannot be specified in isolation but only in relation to other elements in the motion cycle. Adherents to time and motion study principles have assumed that all motions can be analyzed into elements and these additively combined as though each was independent of the others. Studies in which travel distance and manipulation were systematically varied have shown that elements of each interact with the other. Other studies have examined the import of perceptual factors and precision in motion cycles and have arrived at the same conclusion: elements of motion cannot be specified independently but only in relation to the other elements in the cycle. This contention is related to the Gestalt concept that the whole is more than the sum of the parts.

R 22

25,554

Winnick, Wilma A. & Dornbush, Rhea L. PRE-AND POST-EXPOSURE PROCESSES IN TACHISTOSCOPIC IDENTIFICATION. Percept. mot. Skills, Feb. 1965, 20(1), 107-113. (Queens College, City University, New York, N.Y.).

Results are reported from 2 experiments bearing on right-left retinal differences in tachistoscopic identification. The first demonstrated a significant right-left difference in scores for words, but no difference for anagrams interspersed with the words in random succession. In the second, instructional sets (pre- and post-exposure) set up directional tendencies leading to right-left differences in ease of identification. These findings are viewed as favoring an attentional rather than a neurological basis for right-left retinal differences in identification; specifically, they point to the role of previous reading habits in arousing sets conducive to directional eye movements.

R 9

25,555

York, E. POST-FLIGHT CHEST DISCOMFORT IN AVIATORS: AERO-ATELECTASIS. BuMed. Proj. MR005.13 0002.18, NADC MR 6516, Rep. 1, Dec. 1965, 7pp. USN Aerospace Medical Research Dept., NADC, Johnsville, Penn. (AD 623752)

3 jet pilots recently flew high G bank maneuvers, while breathing 100% O<sub>2</sub> and wearing anti-G harnesses, as part of an in-flight project for weapons systems development. As a consequence, on more than one occasion, all 3 pilots experienced shortness of breath, cough, and aching in the chest--this latter symptom persisted as long as 3 hrs. following flight. Physical examination was unremarkable. Pulmonary function study revealed a reduction in vital capacity, immediately following flight, of 20-28% as compared to pre-flight levels outside the plane. A partial, reversible collapse of lung tissue ("aero-atelectasis") may be the mechanism for the observed finding, which could conceivably contribute to aircraft accidents, if not modified.

R 5

25,556

Bluhm, P.M. & Kennedy, W.A. DISCRIMINATION REACTION TIME AS A FUNCTION OF INCENTIVE-RELATED DRQ ANXIETY AND TASK DIFFICULTY. Percept. mot. Skills, Feb. 1965, 20(1), 131-134. (Florida State University, Tallahassee, Fla.).

This study was concerned with evaluating the effects of incentive-related, transient anxiety on discrimination reaction time in terms of task difficulty. Ss were 472 Mobile, Alabama school children equally representing Negro and white races and the fourth, seventh, and tenth grades. The discrimination task required 32 oddity-problem stimulus cards on which were presented 4 black-and-white-squared patterns, 1 of which was different from the other 3. 4 degrees of difficulty were created. The task was presented under conditions of verbal praise and blame and no incentive. In addition to the discrimination task, each S told stories of 4 TAT cards. Results of repeated measures analysis of variance indicated that, although the level of difficulty of the discrimination task is significantly related to speed of performance, there is no simple relationship between anxiety and task difficulty for either white or Negro Ss.

R 2

25,557

Heim, A.W. & Simmonds, V. THE SHAPES ANALYSIS, A TEST OF SPATIAL PERCEPTION. Percept. mot. Skills, Feb. 1965, 20(1), p158. (Psychological Laboratory, Cambridge, England).

The Shapes Analysis is a group test of spatial perception intended for superior adults. There are 18 2-dimensional and 18 3-dimensional items. Ss are required to complete correctly 12 preliminary examples and have a time limit of 25 min. for the test proper. 40 male students were given the Shapes Analysis (SA) test followed by the Form Relations (FR) test. The results showed: a) a significant correlation of 0.64 ( $p=0.01$ ) between the SA and FR test; b) a significant correlation of 0.59 was found between 2- and 3-dimensional scores; c) the order of SA mean scores for the 4 subgroups was as follows: engineers ( $M=20.3$ ), scientists ( $M=19.8$ ), arts ( $M=16.3$ ) and "changers" ( $M=15.0$ ). (HEIAS)

R 2

25,558

Buckhout, R. THE BLIND FINGERS. Percept. mot. Skills, Feb. 1965, 20(1), 191-194. (Washington University, St. Louis, Mo.).

An investigation of "aphotic digital color sensing" (finger vision) was conducted with 40 male and 40 female students attempting to detect an odd color with their fingers when normal visual contact was eliminated. Ss were instructed to place their hands through armholes and to feel 3 colored papers and locate the different or odd color. The mean number of correct identifications was 15.16 against a predicted mean of 15. A t-test showed that the group means did not significantly differ from chance. An analysis of variance showed no significant sex differences and none between the 2 books of stimulus plates. The results did not support the hypothesis that dermal color discrimination occurs in man. (HEIAS)

R 2

25,559

Edgington, E.S. A TYPE OF SPURIOUS CONSTANT ERROR IN MAGNITUDE ESTIMATION. Percept. mot. Skills, Feb. 1965, 20(1), 199-202. (University of Alberta, Edmonton, Alberta, Canada).

Overestimation of small magnitudes and underestimation of large magnitudes has occurred in the estimation of magnitudes of various kinds. Causes of O & U errors include: a) regression effect; and b) limit effect. Better experimental control could reduce regression as well as limit effects. It also could increase the opportunity for genuine constant error to manifest itself. Limit effect is minimized when S has no assumptions regarding the possible limits of the stimulus magnitude. (HEIAS)

R 6

25,560

Devane, J.R. KINESTHETIC AFTEREFFECT FOLLOWING INTERMITTENT STIMULATION. Percept. mot. Skills, Feb. 1965, 20(1), 219-222. (Villanova University, Villanova, Penn.).

The present study reports an attempt at the development of a KAE similar or parallel to that obtained through the typical method of study, but employing an intermittent stimulus rather than the constant width for the inspection width. 22 Ss presented with an inspection stimulus varying regularly throughout a range with a terminal width of 2 in. showed a KAE relative to the 2 in. width. Such stimulation is in effect intermittent, relative to the 2 in. width, and permits better control over the amount of inspection stimulation and over the time relationships between inspection and distraction than does the typical inspection stimulation employing an inspection stimulus of constant width.

R 6

25,561

Hack, J.M., Robinson, H.W. & Lathrop, R.G. AUDITORY DISTRACTION AND COMPENSATORY TRACKING. Percept. mot. Skills, Feb. 1965, 20(1), 228-230. (Douglass College, Rutgers University, New Brunswick, N.J.).

As a partial replication of a study reporting no differences in compensatory tracking due to an intermittent auditory distraction, the current study included control of individual differences and a more sensitive measure of tracking performance. 20 Ss were used. As an indicant of the general level of psychomotor performance, practice trials were given on a pursuit rotor. The target was a metal disk 3/4 in. in diameter mounted 3 1/4 in. from the center of a black bakelite disk. This disk was rotated at a constant speed of 60 rpm. The experimental task was that of the compensatory tracking of a complex 2-dimensional driving function (combinations of the sines of .10 cps, .12 cps, & .15 cps) visually presented on an oscilloscope. Results indicated an initial decrement in performance due to auditory distraction, followed by an adaptation to the distracting condition.

R 5

25,562

Burg, A. APPARATUS FOR MEASUREMENT OF DYNAMIC VISUAL ACUITY. Percept. mot. Skills, Feb. 1965, 20(1), 231-234. (University of California, Los Angeles, Calif.).

An apparatus is described by means of which dynamic visual acuity, or the ability to perceive an object when there is relative motion between the O and the object, can be measured. The system is based on a rotating slide projector (mounted above S's head) by means of which visual acuity targets are projected upon a cylindrical screen. The apparatus consists basically of a 35-mm automatic slide projector which is mounted in a rotatable cradle driven by a variable-speed drive motor. A checkerboard acuity target image is projected on a 180° cylindrical screen 2 ft. high and 4 ft. in radius.

R 2

25,563

Greenwald, A.G. SKILL AND MOTIVATION AS SEPARABLE COMPONENTS OF PERFORMANCE. Percept. mot. Skills, Feb. 1965, 20(1), 239-246. (Educational Testing Service, Princeton, New Jersey.).

A music learning experiment was performed, illustrating the possibility of isolating certain components of performance (labeled Skill and Motivation) by using separate measurement situations for each. 25 fifth-grade children participated in the experiment. Straightforward application of Hullian theory--which considers that component factors of performance interact prior to overt behavior and are not thus separable in measurement situations--to the experiment's data led to a self-contradiction. It was shown, further, that Hull's theory could be considered consistent with the present data only when certain assumptions of dubious plausibility were made.

R 3

25,564

Schiller, P.H. METACONTRAST INTERFERENCE AS DETERMINED BY A METHOD OF COMPARISONS. Percept. mot. Skills, Feb. 1965, 20(1), 279-285. (Massachusetts Institute of Technology, Cambridge, Mass.).

Interaction between successively presented visual stimuli with adjacent contours was investigated in order to see whether maximal metacontrast which appears typically at intermediate interstimulus intervals (ISI) is also obtainable when a method of comparisons is employed where several interference stimuli are shown, only 1 of which is preceded by a test stimulus. When such a method is used, for the 2 highly practiced Ss employed in this study, data showed that the first stimulus was nearly always detectable at intermediate ISIs (50 to 100 msec.). However, when the duration of the test stimulus was very short, its detectability decreased as the interstimulus interval decreased, becoming maximal at the shortest interstimulus interval. Similar findings were obtained with the method of comparisons when the successively presented stimuli overlapped.

R 10

25,565

Gregson, R.A.M. & Russell, P.N. PSYCHOPHYSICAL POWER LAW EXPONENT VALUE FOR SUCROSE INTENSITY. Percept. mot. Skills, Feb. 1965, 20(1), p294. (University of Canterbury, Christchurch, New Zealand).

The value of Stevens' power law for aqueous sucrose solutions was redetermined, using cross-modal ratio matching to line lengths. 20 Ss matched ratios based on paired comparisons of aqueous sucrose solutions in the 0.75 to 10.0 gm/ml concentration range; each S did 3 sessions at 1-day intervals. Exponents were fitted separately to each 5 x session block by linear regression. Mean exponent was 0.622, with SD=0.154. A tendency to bimodality was noted in the distribution, and the degree of variability between Ss is of comparable magnitude to the differences between exponents for different continua as given by Stevens. No significant correlation was found between hedonic ratings for the most intense sucrose solution and the exponent for each S, thus failing to support an hypothesis relating hedonic gradient to perceived intensity differences. (HEIAS)

R 6

25,566

Nickerson, R.S. & McGoldrick, C.C., Jr. CONFIDENCE RATINGS AND LEVEL OF PERFORMANCE ON A JUDGMENTAL TASK. Percept. mot. Skills, Feb. 1965, 20(1), 311-316. (USAF Decision Sciences Lab., Hanscom AFB, Mass.).

A 4-alternative forced-choice test was administered to 96 Ss. S's task was to attempt to select the correct alternative from each test item and to indicate his degree of confidence in his choice on a 5-point rating scale. The objective was to compare the confidence assignments of Ss who did relatively well on the primary judgmental task with those of Ss who did poorly. It was found that Ss who performed poorly on the primary task (LP Ss) tended on the average to use lower confidence ratings than Ss who did relatively well (HP Ss). Although few used either high or low ratings exclusively, all Ss tended to use 1 end of the confidence scale much more frequently than the other. However, whereas HP Ss were fairly consistent in using the high end of the scale, LP Ss were about evenly divided between those using the high end and those using the low. For both groups, performance tended to be monotonically related to expressed confidence. In terms of measures developed by Adams & Adams, HP Ss made more "realistic" confidence judgments than did LP Ss; however, there was no striking difference between groups in terms of differences in performance associated with step increases in expressed confidence.

R 6

25,567

Nance, R.D. PACING AND ANXIETY LEVEL ON THE PURSUIT ROTOR. Percept. mot. Skills, Feb. 1965, 20(1), 325-326. (University of Wisconsin, Milwaukee, Wisc.).

The relationship of manifest anxiety to performance level on both the unpaced and the paced pursuit rotor, as well as to transfer between the 2 kinds of practice, was investigated. Ss were 40 university men and women with no previous experience. The most obvious relationship with anxiety was obtained in the case of the highly anxious male Ss. High anxiety men who did paced work first showed good learning curves on both types of work. High anxiety men who did paced work second showed a good learning curve with most of the improvement occurring, as expected, during the first few trials.

R 3

25,568

Knapp, R.H. & Lapuc, P.S. TIME IMAGERY, INTROVERSION AND FANTASIED PREOCCUPATION IN SIMULATED ISOLATION. Percept. mot. Skills, Feb. 1965, 20(1), 327-330. (Wesleyan University, Middletown, Conn.).

The purpose of the study was to relate the Knapp Time Metaphor Scale to the Myers-Briggs Type indicator of introversion and to the Hypothetical Isolation Test. 49 male college freshmen were administered the 3 scales. The propensity to view time in passive-oceanic images is shown to be positively correlated with introversive tendencies as manifest on the Myers-Briggs Type Indicator and with preoccupation with moral and rational discipline under conditions of extreme hypothetical personal isolation. The existence of this 3-fold syndrome is seen as related to the character and orientation of the ego structure, manifesting itself in the 3 separate but highly correlated ways.

R 2



25,569

Earl, W.K. & Goff, J.D. COMPARISON OF TWO DATA ENTRY METHODS. Percept. mot. Skills, April 1965, 20(2), 369-384. (Aeronutronic Div., Philco Corporation, Newport Beach, Calif.).

The purpose of this experiment was to measure the effects of a number of display and input variables on the relative speed and accuracy of input performance when using point-in and type-in data entry methods for entering alphabetical material into automatic data processing machines. The factors tested in the experimental design were: types of arrangement of display material, density of material, different types of input tasks, typing ability, sex, and relative location of the keypunch device to the operator. 12 male and 12 female Ss were employed in the study. Each S was tested twice under each of the 120 experimental conditions, resulting in 240 trials for each S. The major finding of this study was that the point-in data entry method was a more accurate input technique than either the type-in or mixed point-in type-in data entry methods when measured under the effects of the independent variables.

R 3

25,570

Tobias, J.V. BINAURAL RECORDINGS FOR TRAINING THE NEWLY BLIND. Percept. mot. Skills, April 1965, 20(2), 385-391. (US Civil Aeromedical Research Institute, Oklahoma City, Okla.).

This study investigated the hypothesis that travel behavior is modified through training with binaural recordings. 10 men and 10 women with normal vision and hearing served as Ss. Ss with normal vision and hearing were asked to follow a sound through a series of rooms while walking blindfolded. Ss who were previously trained (by listening to short binaural recordings of sounds similar to those they had to follow while blindfolded) made their tour at a significantly slower rate than those who were given no previous experience of any kind. The relative slowness produced by training suggested that experience leads Ss to behave more cautiously and to listen to their surroundings with somewhat greater attention. The use of such recorded training materials for the newly blind thus provides an adequate early step toward rehabilitation.

R 4

25,571

Hildt, M.T. & Van Liere, D.E. INFLUENCE OF TEST FIGURE DEPTH CUES ON THE SPIRAL AFTEREFFECT. Percept. mot. Skills, April 1965, 20(2), p392. (University of Colorado, Boulder, Colo.).

This study was designed to determine whether the depth cue characteristics of the test figure would affect the spiral aftereffect. The inspection figure was a black-on-white, 2-throw, apparently contracting Archimedes spiral. 2 test figures were used, 1 of which contained depth cues. 34 of 38 Ss reported approaching motion of at least 1 of the 2 test figures. Results were calculated only for those Ss who reported an aftereffect. In subgroup comparisons by t-test there were no significant effects of test figure order or presentation or eye used. The mean aftereffect durations were 14.68 sec. for the depth-cued and 9.09 sec. for the non-depth-cued test figures. Results demonstrate the facilitating effect of depth cues in the test figure on the spiral aftereffect. (HEIAS)

R 3

25,572

Borko, H. A FACTOR ANALYTICALLY DERIVED CLASSIFICATION SYSTEM FOR PSYCHOLOGICAL REPORTS. Percept. mot. Skills, April 1965, 20(2), 393-406. (Systems Development Corporation, Santa Monica, Calif.).

A sample of approximately 1000 abstracts was obtained from Psychological Abstracts and keypunched for computer processing. Based upon a frequency distribution of words in these abstracts, 150 tag-terms were selected. These terms were intercorrelated on the basis of their co-occurrence in documents, and the resulting matrix was factor analyzed. The factors were interpreted as representing classification categories. These were compared with, and shown to be similar to, the APA classification system. The study demonstrates that it is possible to determine the basic dimensions of a collection of documents by an analysis of the words used in their abstracts.

R 5

25,573

Applewhite, P.B., Paulhe, G.P. & Thompson, D.A. FREQUENCY DISTRIBUTION SHAPE AND WORK OUTPUT. Percept. mot. Skills, April 1965, 20(2), 407-408. (Rehabilitation Medicine Div., Stanford University Medical School, Stanford University, Stanford, Calif.).

This experiment was designed to see how the shape of frequency distributions, plotting time-to-assemble-one-unit as the abscissa and frequency-of-occurrence as the ordinate, would vary with changes in the mean output, the average number of units produced. 40 college students were asked to perform a complex assembly task at 4 different levels of speed ranging from "slow" to "as fast as possible" for a period of 15 min. for each level. The results indicate that changes in the mean performance times are accompanied by changes in the parameters that reflect the shape of the generated frequency distributions. (HEIAS)

R 7

25,574

Karlins, M. & Lamm, H. SEX DIFFERENCES AND MOTOR TASK PERFORMANCE. Percept. mot. Skills, April 1965, 20(2), p430. (Princeton University, Princeton, N.J.).

In this experiment designed to investigate possible performance differences between men and women on a hand-eye coordination exercise, 50 male and 50 female Ss performed a simple repetitive motor task of filling Xs in circles, as rapidly as possible, for 50 min. Findings: a) no sex difference during the first 5 min.; b) no significant sex difference in performance in the total 50 min.; c) Ss performed faster during the first min. than during the fifth min. ( $p < .01$ ); d) performance was more rapid during the time block 6-10 min. than during the last 5 min. of the task. (HEIAS)

R 4

25,575  
Gibbs, C.B. & Logan, O. TESTS OF THE FUNCTIONS OF PROPRIOCEPTION AND INTERACTION OF SENSES. Percept. mot. Skills, April 1965, 20(2), 433-442. (Defense Research Medical Laboratories, Toronto, Canada).

It was hypothesized that the speed and direction of movement are monitored by proprioceptive feedback and that extent is determined by integrating the rate signals in time (Gibbs, 1954). Consideration of analogous servo mechanisms leads to the following predictions that were tested and confirmed ( $p < 0.01$ ) in tests using 6 female and 4 male Ss. Input data from vision or proprioception alone or from both senses will produce rapid, primary adjustments of equal accuracy. Terminal accuracy was measured to show that the end-points of most residual errors lie in a limited zone of clear central vision, as required by hypotheses. Various previous estimates alleging gross inaccuracy of proprioceptors (Ludvig, 1952; Crawford, 1960) are shown to be erroneous and irrelevant.

R 7

25,576  
Lathrop, R.G. SOME PRINCIPLES FOR DEVELOPMENT OF NEW MEASURES OF HUMAN CONTINUOUS PERFORMANCE. Percept. mot. Skills, April 1965, 20(2), 453-458. (Chico State College, Chico, Calif.).

The first section of the article deals with the various measures that have been used to assess human continuous performance. According to Bahrick, Fitts, & Briggs root-mean-squared error is the best single measure of tracking performance. 4 general criteria to guide the development of new measures of performance are outlined. These are concerned with the new measure's theoretical implications, statistical adequacy, reliability and validity, and relationship to other measures of performance. The application of these 4 criteria are discussed in relation to a hypothetical measure of performance. Limitations of this approach for current experimental research are outlined. (HEIAS)

R 14

25,577  
Payne, W. ACQUISITION OF STRATEGIES IN GAMING SITUATIONS. Percept. mot. Skills, April 1965, 20(2), 473-479. (USN Training Research Lab., ONR, Washington, D.C.).

The purpose of the study was to determine whether Ss, playing in pairs, would adopt minimax strategies on relatively complex 5x5 2-person zero-sum games. 8 college students served as Ss. 4 5x5 non-saddle-point games were presented on color-coded apparatuses. Ss learned to approximate the minimax strategies for both sides of each of the 4 games. Differences in case of learning among games were significant. No transfer of training from 1 game to another was obtained. (HEIAS)

R 5

25,578  
Smith, A.H. INTERACTION OF FORM AND EXPOSURE TIME IN THE PERCEPTION OF SLANT. Percept. mot. Skills, April 1965, 20(2), 481-490. (Defence Research Medical Labs., Toronto, Ontario, Canada).

Groups of 24 Os estimated the slant of a circle and a rectangle (Groups I, II, & III) or a circle and a square (Group IV) by setting a tilt-rod. The forms were viewed at 45° slant, monocularly and binocularly, with fixed head, under reduced conditions. Exposure durations were: for Groups I, II, & IV, 5, 4, 3, 2, & 1 sec., imposed in descending order; and for Group III, 5 3-sec. exposures. Groups I & III left the tilt-rod at the response setting, and Groups II & IV returned it to vertical, after each response. With reduced exposure, over-all estimates of slant decreased for the response setting (Group I), but decreased less (Group IV), or did not change significantly (Group II) for the vertical setting. The difference between the estimates for the circle and rectangle or square increased with reduced exposure time due mainly to decrement for the angular forms. The discussion relates the over-all result to an anchor effect of tilt-rod position, and the trend difference for form to differential salience of projective outline distortion and convergence.

R 12

25,579  
Culbert, S.S. OBJECT RECOGNITION AS A FUNCTION OF NUMBER OF DIFFERENT VIEWS DURING TRAINING. Percept. mot. Skills, April 1965, 20(2), 491-492. (University of Washington, Seattle, Wash.).

A strip of views of a complex polyhedron was prepared, representing 768 different orientations of the target in random order. The frame was presented, frame by frame, to 22 Ss. Their ability to recognize the target was then tested. The strip was then cut in halves of 384 views each. One half was used as a training series for a group of 10 Ss, the other half was run through twice by a comparable group. The process of halving was continued with a random selection of 4 segments being chosen after each halving, each segment being used as a training series for a different group of 10 or 11 Ss. t-tests showed that the number of different views in the training series, from 12 to 768, made no difference in performance. (HEIAS)

25,580  
Danziger, K. EFFECT OF VARIABLE STIMULUS INTENSITY ON ESTIMATES OF DURATION. Percept. mot. Skills, April 1965, 20(2), 505-508. (University of Cape Town, Cape Town, South Africa).

The experiment was designed to verify and extend the observations of Fraisse & Oleron and provide information about the existence of a relationship between the cognition of duration and the primary cognition of stimulus change. 40 male students acted as paid Ss. Judgments of the duration of tones increasing or decreasing in intensity over a range of 22 db were compared with judgments of the duration of tones of constant intensity for stimulus durations of 2, 4, 6, 8, & 12 sec. The duration of tones of varying intensity was significantly underestimated relative to the constant tone at the shorter stimulus lengths. The effect was only observed for tones of increasing intensity at stimulus durations of 8 sec. and not at all at stimulus durations of 12 sec. A general inverse relationship between rate of stimulus change and estimated duration is suggested for stimulus changes above a critical rate.

R 4

25,581

Aiken, L.R., Jr. LEARNING AND RETENTION IN THE ESTIMATION OF SHORT TIME INTERVALS: A CIRCUIT AND A STUDY. Percept. mot. Skills, April 1965, 20(2), 509-517. (University of North Carolina, Greensboro, N.C.).

An investigation of the temporal course of learning and retention in the estimation of short time intervals is reported. In addition, a versatile response feedback circuit used in this investigation and appropriate for other studies concerned with time estimation or delayed responding is described. The experimental design was a 6 time intervals (1 1/2, 3, 4 1/2, 6, 7 1/2, & 9 sec.) by 6 Ss balanced Latin square in which 6 adult female Ss made 10 pre-feedback, 25 feedback, and 15 post-feedback time estimates by terminating a 500-cps stimulus tone when they judged it to have been on for a certain time interval. Feedback consisted of informing S if she had responded too soon, too late, or at the correct time. Analysis of the 1800 absolute differences in msec. between real and estimated interval gave the following results; a) during the pre-feedback phase, there was a moderate negative relationship between accuracy of time estimation and duration of interval estimated; b) accuracy of estimation improved on the trial following the first feedback trial, but little further improvement during the feedback phase was noted; c) amount of improvement in accuracy of estimation with feedback had a moderate negative relationship to duration of interval estimation; d) accuracy of estimation declined rather rapidly during the post-feedback phase.

R 5

25,582

Gould, J.D. & Schaffer, Amy. EYE-MOVEMENT PATTERNS IN SCANNING NUMERIC DISPLAYS. Percept. mot. Skills, April 1965, 20(2), 521-535. (IBM Watson Research Center, Yorktown Heights, N.Y.).

Eye movements of 3 Ss during visual scanning of 15" 21' 6x6 numeric matrices were studied, using a modification of the Mackworth eye-marker apparatus, as a function of frequency of target numeral (0 to 7), digit scanned for, and learning (176 trials). The results indicated that time to scan varied significantly with both frequency and target digit, and these time differences were reflected by significant departures from the over-all average number of fixations (18), while average duration of fixations (.31 sec.) remained relatively constant. The average durations of fixations on target numbers (.32 sec.) and non-target numbers (.30 sec.) were not statistically significantly different. Average center-to-center distance between the closest fixation and a target number was 2° 28' and this distance differed among digits, being 2° 42' for the most quickly recognized and 1° 36' for the most difficult to recognize. The results indicated the possible role of eye movements in information processing.

R 16

25,583

Barendregt, J.T., Van Bergen, C.N.A. & Van Nooten, W.N. POSITIVE AND NEGATIVE HYSTERESE EFFECTS ON CRITICAL FLICKER-FUSION THRESHOLDS. Percept. mot. Skills, April 1965, 20(2), p536. (University of Amsterdam, Amsterdam, Holland).

In determining the critical flicker-fusion (cff) threshold the method of constant stimuli and that of ascending and descending intermittence of the light in the stimulus field may be used. The present investigation tested the hypothesis that differences in speed of ascending or descending intermittence, are responsible for the discrepancy in empirical results. Sinus-shaped modulated light of 24 cps was used. There were 2 conditions (ascending modulation from 10 to 20% and descending modulation from 20 to 10%) and 6 speeds (10, 20, 30, 40, 50, & 60 sec. to change from 10 to 20% or from 20 to 10% modulation). 6 Ss individually were given 6 trials, under each speed and condition, making 2 (conditions) X 6 (speeds) X 6 (trials) = 72 trials for each S. Conditions were alternated; speeds were randomized. S sat in a small unlit room, 1 m. from a wall on which a lighted square of about 150 cm<sup>2</sup> was projected. In the middle of the square was a fixation point. Between trials the projected light remained on. S pressed a button to stop change in modulation depth and indicate that he had reached the cff threshold. For each of the 6 Ss a reversion of cff was found. The cff thresholds were determined by the method of constant stimuli. These correlated highly with the ordinates of intersections of their ascending (fusion-flicker) and descending (flicker-fusion) threshold curves.

R 3

25,584

Nelson, T.M. & Vasold, P.C. DEPENDENCE OF OBJECT IDENTIFICATION UPON EDGE AND SURFACE. Percept. mot. Skills, April 1965, 20(2), 537-546. (University of Alberta, Edmonton, Alberta, Canada).

The importance of characteristics of edge and surface to object recognition was investigated. Recognition times of 32 male Ss were established for samples of positive and negative prints made from photographs of 20 common items. Prints were presented in likely order of ascending difficulty. The beginning exposure time of each print was fixed at .01, .02, or .05 sec. depending on whether the pilot study indicated easy or difficult observation. Time was increased by fixed amounts until S gave 3 identical responses and was willing to assert satisfaction with his identification. Median recognition times were computed. Results show that identification depends upon the extent to which photic zones and gradients defining the surface maintain their inter-relationships. Dependence upon surface increases with the difficulty of identification.

R 10

25,585

Pease, V.P. & Sticht, T.G. REACTION TIME AS A FUNCTION OF ONSET AND OFFSET STIMULATION OF THE FOVEA AND PERIPHERY. Percept. mot. Skills, April 1965, 20(2), 549-554. (University of Arizona, Tucson, Ariz.).

The purpose of the study was to determine the relationship between RT and the onset and offset of a visual stimulus when: a) stimulation was restricted either to the fovea or to the periphery; b) a wide range of stimulus values was employed; and c) a small (20') stimulus area was used. 3 male Ss were used after many hours practice. RTs were obtained for the onset and offset of luminous stimuli of 31,400 m<sup>2</sup>, 314 m<sup>2</sup>, and 198 m<sup>2</sup>, presented in the fovea and periphery. An ANOVA showed that in the periphery offset RTs are longer than onset RTs. The opposite is true for the fovea. In both the fovea and periphery the differences between the onset and offset RTs decrease as the luminance increases. (HEIAS)

R 10

25,586

Fieandt, K.V., Ahonen, L., Jaervinen, J., Lian, A. COLOR EXPERIMENTS WITH MODERN SOURCES OF ILLUMINATION. Percept. mot. Skills, April 1965, 20(2), 555-556. (University of Helsinki, Helsinki, Finland).

2 experiments are reported in which incandescent bulbs and fluorescent tubes were applied alternately. In the 1st experiment on chromaticity contrast using 3 Ss, complementary colors were applied. When the surrounding field was blue, fluorescent illumination (FL) strengthened contrast induced on a surrounded yellow field. In the second experiment 12 Ss were used, and red and bluish-green were used as complementary colors. A red surrounding field yielded strongest contrast effect under incandescent light (IL). The perimetric thresholds of all colors were increased when changing from IL to FL, i.e., they could be recognized further out in the periphery. The rise was strongest for blue. (HEIAS)

R 1

25,587

Koehler, W. MOVEMENT AFTEREFFECTS AND FIGURAL AFTEREFFECTS. Percept. mot. Skills, April 1965, 20(2), 591-592. (Dartmouth College, Hanover, N.H.).

Recent work on certain movement aftereffects has shown that the duration of such effects is greater in the lower half of the visual field than it is in the upper half. This finding is said to be opposed to the theory of figural aftereffects developed by Koehler & Wallach. Closer examination of the situation shows that the new facts agree with the theory.

25,588

Revusky, B.T.L., Moore, J.W. & Dzendolet, E. CONDITIONING OF THE HUMAN VESTIBULAR SWAY RESPONSE. Percept. mot. Skills, April 1965, 20(2), 593-600. (University of Massachusetts, Amherst, Mass.).

57 human Ss participated in a demonstration of conditioning of the postural sway response elicited by low current sinusoidal electrical stimulation of the vestibular apparatus. In addition to a conditioning group which received paired presentations of a tone CS and vestibular stimulation, there were 3 control groups: a group which received the CS alone, another which received the UCS alone, and a third which received random unpaired presentations of the CS and UCS. A score was devised to quantify the change in swaying following stimulus presentation relative to a pre-trial baseline level; the results were subjected to ANOVA.

R 5

25,589

Haber, R.N. AUTOMATIC MEASUREMENT AND RECORDING OF LATENCY DATA. Percept. mot. Skills, April 1965, 20(2), 605-608. (University of Rochester, Rochester, N.Y.).

A method of recording latencies is described, which is used in conjunction with an IBM 024 keypunch. In this way, it is not necessary for the latency to be read and recorded visually, since it can be punched in digital form directly onto IBM cards. A number of applications are briefly enumerated, including a more detailed description of the use of a single system to record successive response times as S progresses through timed segments of a pathway.

R 3

25,590

Andreas, B.G. & Miller, L. PROBABILITY OF RESPONSE REPETITION IN SERIAL MOTOR PERFORMANCE AS A FUNCTION OF NUMBER OF PREVIOUS OCCURRENCES. Percept. mot. Skills, April 1965, 20(2), 609-613. (University of Rochester, Rochester, N.Y.).

The probability of response repetition in a serial perceptual-motor performance was studied as a function of the number of previous occurrences of each particular response. Data from 44 college students performing a letter-maze task showed the function to be a negatively accelerated curve with p increasing from around .50 after 1 repetition to almost 1.00 after 7 or 8 repetitions. Number of previous occurrences was claimed to be a better determinant of repetition than ordinal trial number for purposes of theory testing. Further study was suggested with a technique to reduce perceptual search demands.

R 2

25,591

Cobb, J.C., Evans, F.J., Gustafson, L.A., O'Connell, D.N., et al. SPECIFIC MOTOR RESPONSE DURING SLEEP TO SLEEP-ADMINISTERED MEANINGFUL SUGGESTION: AN EXPLORATORY INVESTIGATION. Percept. mot. Skills, April 1965, 20(2), 629-636. (University of Pennsylvania, Philadelphia, Penn.).

The study was designed to investigate the phenomenon of sleep-administered, and sleep-elicited suggestion. Complex meaningful suggestions were given during various stages of physiological sleep as defined by EEG monitoring to 4 Ss high and 4 Ss low in hypnotizability. All the high hypnotizability Ss gave accurate behavioral responses while remaining asleep, but none of the low hypnotizability Ss did so. Specific response to sleep-administered suggestion was obtained only during Stage 1 periods. These results show the feasibility of using a sleep-sleep model for the investigation of complex, meaningful interactions in the sleeping S.

25,592

Ochberg, F.M., Pollack, I.W. & Meyer, E. REPRODUCTION AND ESTIMATION METHODS OF TIME JUDGMENT. Percept. mot. Skills, April 1965, 20(2), 653-656. (Johns Hopkins Hospital, Baltimore, Md.).

2 methods of time judgment, the method of reproduction and the method of estimation, were compared. Ss were 10 women blindfolded after ocular surgery, 10 women not blindfolded after ocular surgery, and 10 visually normal female employees of the hospital. Time judgment tasks were administered on 5 consecutive days. Mean scores were compiled for all Ss and subjected to an ANOVA. The reproduction task was handled equally well by all groups, and time estimates were given with greater accuracy and reproducibility than for the estimation task. On the other hand, the method of estimation led to differential performance among groups, with greatest accuracy and least variance in the working group, and least accuracy with greatest variance in the blindfolded group.

R 10

25,593

Stone, H. & Bosley, J.J. OLFACTORY DISCRIMINATION AND WEBER'S LAW. Percept. mot. Skills, April 1965, 20(2), 657-665. (Stanford Research Institute, Menlo Park, Calif.).

Acetic acid and propionic acid were used with 3 reference stimuli to test Weber's Law in olfactory discrimination. 9 Ss underwent a 1-day familiarization period. The olfactometer was employed, and the method of testing was the forced-choice, constant-stimulus method. 6 samples, evenly spaced above and below the reference, were compared by Ss to the constant stimuli. The data have provided additional evidence that jnds are a constant fraction of the stimulus strength. A linear plot of the difference limens and stimulus intensities has yielded a K of 0.28 for olfactory discrimination in man. The treatment of data derived from tests above the 50% limen and the over-all concept of jnd discrimination are discussed. (HEIAS)

R 12

25,594

Pishkin, V. & Shurley, J.T. AUDITORY DIMENSIONS AND IRRELEVANT INFORMATION IN CONCEPT IDENTIFICATION OF MALES AND FEMALES. Percept. mot. Skills, June 1965, 20(3)Part 1, 673-683. (US Veterans Administration Hospital, Oklahoma City, Okla. & University of Oklahoma School of Medicine, Norman, Okla.).

This study analyzes the effects of type of stimulus dimensions and number of irrelevant dimensions in purely auditory concept identification (CI) of older males and females. 60 male and 60 female Ss between 25 & 50 yrs. of age were employed. 4 degrees of complexity and 3 problems with different relevant dimensions were used. All Ss performed until they either made 16 correct, consecutive responses or responded to a total of 192 stimuli. An analysis of variance was carried out. CI was negatively influenced by complexity, and females performed better than males when laterality of CI signal was relevant. Interactions between dimensions were found; explanation of sex differences in CI was attempted. (HEIAS)

R 21

25,595

Anderson, T.I. CORRELATION OF AUDITORY AND VISUAL AUTOKINETIC EFFECTS. Percept. mot. Skills, June 1965, 20(3)Part 1, 697-707. (Mental Health Services Div., San Mateo County, Calif.).

This study involved an investigation of the relationships between visual and auditory autokinetic phenomena. An apparatus was designed to obtain quantifiable records of the perceived auditory autokinetic loudness and pitch effects. Several methods were devised to score these records. When the auditory and visual autokinetic scores were correlated, all of the obtained coefficients were positive, 4 correlations were significant at the .05 level (only 1 was expected by chance), and 1 correlation at the .01 level. Some associated unanswered questions were discussed to indicate certain problems for future investigation. The statistical analyses indicated a tentative affirmation of the hypothesis that both the auditory and visual autokinetic phenomena are to a significant extent determined by a central, relatively stable perceptual style. The relationship of this perceptual style to other stable character traits has been suggested by Voth & Mayman (18). They have reviewed some of the major dichotomous character typologies (e.g., extroversion-introversion, field dependent-field independent, etc.) in relation to the visual autokinetic effect. Although further discussion of these aspects is beyond the scope of this paper, Voth & Mayman propose psychotherapeutic as well as heuristic significance to their findings which future study may further validate.

R 18

25,596

Dunn, B.E. PERCEIVED SLANT AS A FUNCTION OF RELATIVE HEIGHT. Percept. mot. Skills, June 1965, 20(3)Part 1, p708. (University of Minnesota, Morris, Minn.).

The study was designed to test the hypothesis that the height of a stimulus object in the picture plane may be used as a cue to determine relative depth. 6 outline trapezoids were drawn differing with respect to the relative heights of their left-end and right-end midpoints. Each of 10 Ss viewed the 6 stimuli from a distance of 2 ft and ranked them from most to least slanted. The results supported the hypothesis that relative height is a cue to perceived slant ( $\chi^2 = 41.15$ ,  $p < .001$ ). The extent to which Ss agreed in their ranking of the stimuli is indicated by a concordance coefficient of .80. (HEIAS)

R 4

25,597

Brown, R.L., Galloway, W.D. & Gildersleeve, K.R. EFFECTS OF INTENSE NOISE ON PROCESSING OF CUTANEOUS INFORMATION OF VARYING COMPLEXITY. Percept. mot. Skills, June 1965, 20(3)Part 1, 749-754. (USA Infantry Human Research Unit, Fort Benning, Ga.).

36 enlisted men identified a series of electropulse messages under varying auditory noise conditions. 3 levels of message complexity were combined factorially with intermittent noise, continuous noise, and no-noise conditions. Ss in Simple message groups were asked to indicate on each trial which 1 of 5 electrode location was stimulated. Compound message groups identified both location of stimulation (1 of 5 loci) and pulse duration (.2, 1.6, or 2.5 sec.). Finally, Ss in Complex message groups received electropulses at 1 of 5 loci, 1 of 3 durations, and 1 of 2 intensities (1.0 or 1.3 v.d.c.). The amount of information transmitted (I<sub>t</sub>) under differing noise conditions did not differ significantly. I<sub>t</sub> did increase significantly with an increased number of coded elements. However, discrimination accuracy was not affected by the increased code difficulty. It was concluded that intense auditory noise has little effect upon the reception and processing of cutaneously presented information.

R 15

25,598

Goldstein, K.M. STIMULUS REINFORCEMENT DURING SENSORY DEPRIVATION. Percept. mot. Skills, June 1965, 20(3)Part 1, 757-762. (Princeton University, Princeton, N.J.).

The study explores the need for sensory stimulation during sensory deprivation (S.D.). Confined and nonconfined Ss were compared on time spent button-pressing for visual, auditory, visual and auditory or no stimulation. Thus, there were 8 treatment groups of 10 human Ss each. The total amounts of time that Ss in the different treatment groups spent pressing the button to receive stimulation were treated by a 2x2x2 analysis of variance. Ss in confinement spent more time button-pressing than did nonconfined Ss. Ss receiving such visual stimulation spent more time button-pressing than did Ss not receiving such stimulation. No significant relationships were found between button-pressing behavior and performance on a variety of tests.

R 17

25,599

Costa, L.D., Vaughan, H.G., Jr. & Gilden, L. COMPARISON OF ELECTROMYOGRAPHIC AND MICROSWITCH MEASURES OF AUDITORY REACTION TIME. *Percept. mot. Skills*, June 1965, 20(3)Part 1, 771-772. (Albert Einstein College of Medicine, Yeshiva University, New York, N.Y.).

The contribution of mechanical lag in microswitch closure to total auditory reaction time was evaluated by comparison of RT timed by switch closure with that to the onset of the electromyographic activity associated with the response. The RT's of 3 Ss to clicks at 10, 30 and 90 db above their individually measured thresholds were obtained. It was concluded that use of a microswitch for signalling motor response introduces a significant delay in comparison with an EMG measure. Large reliable individual differences in amount of switch lag were found. Switch lag decreased slightly as intensity was increased.

R 1

25,600

Smith, S., Farrel, R.J. & Gonzalez, Barbara K. EFFECTS OF CONTROL-DISPLAY COMPATIBILITY AND MONITORING CUES ON MULTIPLE-TASK PERFORMANCE. *Percept. mot. Skills*, June 1965, 20(3)Part 1, 781-785. (Boeing Company, Seattle, Wash.).

90 Ss participated in an experiment involving simultaneous performance on warning light, meter-centering, and tracking tasks. Switch/meter control-display compatibility (natural, unnatural, and inconsistent) and monitoring tone cues (directional, nondirectional, and no cues) were varied. Each S performed 40 20-sec. trials under 1 experimental condition (1 of the 9 possible combinations of the 2 independent variables). Analyses of variance were calculated for each measure and average total task scores for the independent variables were compared with Duncan's multiple-range test. Directional cues and consistent control-display relationships resulted in the best performance; absence of tone cues and the inconsistent relationship resulted in the poorest. Meter-task data revealed no control-display relationship differences but tracking and combined-task data did. Monitoring tone cues significantly improved performance. Multiple-task performance is not necessarily predicted from knowledge of single-task performance.

25,601

Fried, C., Rosenfeld, A. & Gerstman, L.J. SEQUENTIAL AND PARALLEL PROCESSING IN BOUNDARY SELECTIONS ON ONE-DIMENSIONAL PICTORIAL STIMULI. *Percept. mot. Skills*, June 1965, 20(3)Part 1, 789-801. (Budd Information Sciences Center).

Sequential and parallel scanning models were devised to predict Ss' selections of boundaries between dissimilar regions on one-dimensional film strips. The use of this type of stimulus material is justified and the method of its construction is discussed. Variations of the original film strips were employed to provide further tests of the models' predicted boundary choices. The stimuli used were 7 film strips constructed from 7 parallel cross-sections of an aerial photograph. 5 naive Ss were used, they were asked to dichotomize the strips by finding the edge of the forest or the point best separating the forest from the non-forest. The analysis consisted of calculating for each choice-point on the strip the percentage of the total number of choices made on the strip. Different groups of Ss were used in the other 4 experiments which were modifications of the original. General agreement was obtained between Ss' boundary selections and those predicted by the models.

R 6

25,602

Morikawa, Y. SUCCESSIVE COMPARISON OF VISUAL SIZE: I. POSITIVE TIME ERROR. *Percept. mot. Skills*, June 1965, 20(3)Part 1, p814. (Waseda University, Totsuka-Machi, Japan).

The experiment was concerned with positive time error (PTE). The stimuli were circles, each drawn on a sheet of white paper with black line of 1 mm width and presented by a modified Dodge's tachistoscope. Each of 5 Os judged the size of the second stimulus ( $S_2$ ) which had the same diameter as the first or  $S_1$  (30 mm). The amount of inhibition or shrinkage of  $S_2$  was estimated as a percentage. Presenting  $S_1$  &  $S_2$  in the same position, the PTE was found to decrease as duration of the pause increased. Using a central fixation point,  $S_1$  &  $S_2$  were presented on the left and right sides. PTE was found to be smaller than in the case of presenting  $S_1$  &  $S_2$  in the same location. The amount of inhibition of  $S_1$  to  $S_2$  was measured by the procedure of simultaneous comparisons. No difference was found between the amount of inhibition and successive and simultaneous comparisons. (HEIAS)

R 2

25,603

Alluisi, E.A. INTERACTION OF S-R COMPATIBILITY AND THE RATE OF GAIN OF INFORMATION. *Percept. mot. Skills*, June 1965, 20(3)Part 1, 815-816. (University of Louisville, Louisville, Ky.).

The purpose of the study was to demonstrate the effect of transmitted information on RT in school children of different ages and grades, thereby showing the interaction of the rate of gain of information with S-R compatibility. The 4 Ss were 5, 7, 9, & 11 yr. old boys. Each S responded to 3 levels of stimulus uncertainty, (Hs), at each level he responded to a total of 40 numerals equally divided among those in the ensemble used. Median RT's were computed for each S at each level. An analysis of variance revealed the following significant results: a) S-R compatibility was greatest for the oldest child and least for the youngest ( $F=165.30$ ,  $df=3/468$ ); b) RT was influenced by both: Hs and S-R uncertainty; the effect of Hs on RT was greatest where S-R compatibility was lowest ( $F=2.87$ ,  $df=6/468$ ,  $p<.01$ ). (HEIAS)

R 3

25,604

Zalosh, Susan & Salzman, L.F. AFTEREFFECTS OF DELAYED AUDITORY FEEDBACK. *Percept. mot. Skills*, June 1965, 20(3)Part 1, 817-823. (University of Rochester, Rochester, N.Y. & University of Rochester School of Medicine & Dentistry, Rochester, N.Y.).

This experiment was designed to test whether there are aftereffects on speech to delayed auditory feedback and whether the aftereffects, if any, are a function of the severity of disruption of speech under the feedback condition. 57 Ss, divided into 3 equal groups, were exposed to various combinations of delay time and intensity of feedback. Ss read 5 phrases each 5 syllables long, presented on index cards. 3 measures of verbal performance were obtained and the results were subjected to a one-way analysis of variance. Comparisons of pre- and post-sidetone responses revealed no evidence of aftereffects on speech. No relationship to induced severity of speech disruption was found.

R 12

25,605

Andreassi, J.L. EFFECTS OF INDUCED MUSCLE TENSION AND AUDITORY STIMULATION ON TACHISTOSCOPIC PERCEPTION. Percept. mot. Skills, June 1965, 20(3)Part 1, 829-841. (USN Training Device Center, ONR, Port Washington, N.Y.).

The effect of accessory stimulation upon tachistoscopic perception of geometric figures was studied. In Exp. I 32 Ss were tested on 2 successive days in a complete factorial design (Subjects x Treatments) in which degree of induced muscle tension (IMT) and level of task difficulty were manipulated. An IMT level of 1/2 of maximum resulted in significantly ( $p < .01$ ) improved visual perception. In Exp. II artificial pupils were employed to test the hypothesis that improved performance was due to pupil dilation. 8 Ss from Exp. I were tested on 5 successive days and performance at 1/2 of maximum IMT was again significantly ( $p < .05$ ) improved, thus precluding pupil dilations as the reason for the results obtained in Exp. I. In Exp. II performance at the middle level of task difficulty benefited significantly ( $p < .05$ ) from IMT. Exp. III investigated the effects of 4 levels of auditory stimulation (white noise) on tachistoscopic perception in a new group of 32 Ss. Perception was significantly ( $p < .05$ ) improved with the 1/4 maximum noise level at the easiest level of difficulty. Results were interpreted within the framework of the activation concept. Recent neurophysiological data point to the ascending reticular activating system as a possible mediator which could influence cortical and retinal areas in the facilitation of tasks such as tachistoscopic perception.

R 22

25,606

Geiwitz, P.J. RELATIONSHIP BETWEEN FUTURE TIME PERSPECTIVE AND TIME ESTIMATION. Percept. mot. Skills, June 1965, 20(3)Part 1, 843-844. (University of Michigan, Ann Arbor, Mich.).

The study attempted to confirm the hypothesis that the more extended the future time perspective, the more will S overestimate the length of present temporal intervals, using a sample of American college students. 20 male and 20 female Ss were tested individually in a repeated measures design involving 4 time estimates and a measure of future time perspective (FTP). The rank-order correlation of FTP with the 12 sec verbal estimate (VE) for males was .63 ( $p < .01$ ), while for the 20 sec production estimate (P) it was -.51 ( $p < .05$ ). Neither the correlation of VE120 (.02) nor that for P200 (.24) approached significance. None of the estimates by females correlated significantly with FTP. This suggests a different subjective method of time estimation by females, a different construct validity for a female FTP or both. (HEIAS)

R 3

25,607

Smith, S.L., Farquhar, Barbara B. & Thomas, D.W. COLOR CODING FOR COUNTING AND COMPARISON TASKS USING FORMATTED DISPLAYS. Contract AF19(628) 2390, Proj. 704.0, SR 134, May 1965, 33pp. Mitre Corporation, Bedford, Mass.

The study represents an attempt to extend earlier work to assess the effects of color, numeric, and symbolic coding using structured displays. 12 Ss were run in several sessions. The task involved: a) summation and comparison of rows of 2-digit entries in tabular formatted displays; and b) counting classes of displayed items. Displays differed in density (number of items), structure, and item coding. Consistent differences were found in both item-counting and row-comparison performance which were related to display density and to certain of the display structural variables. In addition, use of the relevant color code resulted in an average reduction in counting time of 72% and a decrease in error frequency of 86%, where the display format was not related to the task. For the row-comparison task the respective figures due to color coding were 47% & 43%. Relevant underline coding resulted in a statistically reliable 29% decrease in comparison time. It is concluded that color coding can be useful in tasks using structured displays, as in row-comparison tasks. (HEIAS)

R 5

25,608

Weene, P.L. EFFECTS OF RANDOM AND ORDERLY PRESENTATIONS OF VISUAL SEQUENCES. Percept. mot. Skills, June 1965, 20(3)Part 1, 897-903. (USAF Decision Sciences Lab., Hanscom AFB, Mass.).

This study explored the possibility that if the effects of random and orderly presentations are general it is reasonable that these effects can be produced with usual objects as entries and recognition as the task. Sections of figures were presented visually in random and orderly sequences. 4 experiments were performed using different groups of college students as Ss. Performance measures were subjected to analysis of variance. Later identification was easier for orderly sequences and for faster presentations. Fixation and size of section had no effect.

R 6

25,609

Bartlett, N.R. & White, C.T. SYNCHRONIZATION ERROR IN ATTEMPTS TO MOVE THE HANDS SIMULTANEOUSLY. Percept. mot. Skills, June 1965, 20(3)Part 1, 933-937. (University of Arizona, Tucson, Ariz. & USN Electronics Lab., Bureau of Ships, San Diego, Calif.).

The experiment involved 2 parts. In 1, 12 Ss made 20 bimanual synchronization attempts after 6 practice trials. In these attempts S was free to use any technique he chose. The second part was a detailed examination of 3 well-trained Ss, and was designed to test whether bimanual synchronization error depended upon the degree to which the response was triggered by cues external to S. Cylinders served as the hand-held pieces making contact with a metal plate. E started counting operations and S stopped a counter by lifting the appropriate handle. The 12 untrained Ss performed with variation around the means as Ss in a trained Ss the error appeared to be independent of whether the movement was made on signal or at S's option. (HEIAS)

R 4

25,610

Haward, L.R.C. DRUG-INDUCED FATIGUE DECREMENT IN AIR TRAFFIC CONTROL. Percept. mot. Skills, June 1965, 20(3)Part 1, p952. (Graylingwell Hospital, Chichester, England).

A new central stimulant, 5-phenyl-2-imino-4-oxo-oxazolidine was tested in the context of air traffic control (ATC) procedure. The complex task included aircraft control, landing clearance, stacking, and diversion. 20 males, aged 30 to 50 yrs. and of superior intelligence received training. Using a double-blind crossover design, each S underwent 4 2-hr. experimental sessions in ATC following ingestion of placebo or drug in 20-, 40-, & 60-mg. doses, respectively, administered 1 hr. before the commencement of the experiment. Findings: a) vigilance became progressively impaired after 90 min.; b) a placebo had no effect on this impairment; c) the stimulant in 20-mg. doses significantly reduced this impairment; d) the drug was more effective when the level of impairment was higher; e) no side effects occurred at the optimum dose, but were noted at doses exceeding 20-mg.; and f) progressively higher doses had less effect on the impairment and eventually exacerbated the condition. (HEIAS)

25,611

Buchsbaum, M. & Callaway, E. INFLUENCES OF RESPIRATORY CYCLE ON SIMPLE REACTION TIME. Percept. mot. Skills, June 1965, 20(3)Part 1, 961-966. (Langley Porter Neuropsychiatric Institute, University of California, San Francisco, Calif.).

The effect of respiration on simple auditory reaction time was studied. In the first study (N=7), reaction times and respiratory phase data were collected during spontaneous breathing; in Study 2, (N=15), a warning light signaled S to hold his breath in either inspiration or expiration. Both experiments showed faster reaction times with expiration. This contradictory to reaction time findings reported by other investigators who have studied effects of respiration. From the data it appears that respiration influences both frequency of voluntary acts and reaction times.

R 12

25,612

Yensen, R. A FACTOR INFLUENCING MOTOR OVERFLOW. Percept. mot. Skills, June 1965, 20(3)Part 1, 967-968. (University of New South Wales, Sydney, Australia).

This study attempted to confirm the observation that overflow activity in the inactive arm was precipitated by a single flexion and extension of that arm while the active arm isometrically supported a weight which, under normal circumstances, did not lead to overflow activity in the contralateral limb. With S in the supine position surface action potentials from left biceps, left triceps, and right biceps were recorded with a 3 channel DISA EMG. 6 Ss took part. After 20 sec of holding a heavy weight with the right arm, Ss were instructed to flex, extend and immediately relax the left arm. Immediately after this maneuver marked overflow activity occurred in the left biceps and triceps and continues unabated until the right arm was relaxed some 20 sec later. These events are probably associated with muscle spindle functioning.

R 3

25,613

Bevan, W., Hardesty, D.L. & Avant, L.L. RESPONSE LATENCY WITH CONSTANT AND VARIABLE INTERVAL SCHEDULES. Percept. mot. Skills, June 1965, 20(3)Part 1, 969-972. (Kansas State University, Manhattan, Kan.).

12 independent groups were used to examine the relationship between response latency and regularity of signal occurrence. In each of 6 groups 20 simple visual signals were presented sequentially at one of 6 constant intervals. Interval durations were 10, 20, 40, 80, 160, or 320 sec. For each constant-interval group tested, there was also a variable-interval group with intervals of the same average duration. For all intervals except one (40 sec.), the variable-interval groups increasing as a function of the duration of the interval, up to intervals of 160 sec. For both constant- and variable-interval groups, response latency varied directly with interval duration.

R 11

25,614

Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XVIII. PSYCHOLOGICAL INDEX NO. 14, 1907. Percept. mot. Skills, June 1965, 20(3)Part 1, 989-992. (Montana State University, Bozeman, Mont.).

This bibliography contains 97 references to work in perception, listed alphabetically. All of the articles appeared in 1907, most of them in German. (HEIAS)

25,615

Brown, R.L., Galloway, W.D. & San Guillano, R.A. EFFECTS OF TIME-SHARING AND BODY POSITIONAL DEMANDS ON CUTANEOUS INFORMATION PROCESSING. Percept. mot. Skills, June 1965, 20(3)Part 2, 1021-1026. (USA Infantry Human Research Unit, Fort Benning, Ga.).

This study investigated the effects of requiring the concurring discriminations of cutaneous stimuli and visual stimuli of varying complexity. 12 Ss were asked to interpret a series of coded electrocutaneous pulses while engaged in a visual discrimination task of varying complexity. All Ss performed both tasks in each of 4 body positions (standing, sitting, kneeling, and prone). Ss were asked to indicate on each trial which 1 of 4 electrode locations was stimulated and whether duration of stimulation was .6 or 1.6 sec. A constant intensity of 1.5 v at 60 cps was employed. 3 levels of complexity (no visual stimuli, 4x4 metric figures, and 8x8 metric figures) were employed in the visual task. In the cutaneous task, analysis of information transmitted ( $I_t$ ), location errors, duration errors, and total errors indicate that time-sharing demand significantly impaired performance, whereas variation in body position had negligible effect.

R 17



25,616

Wyke, Maria & Chorover, S.L. COMPARISON OF SPATIAL DISCRIMINATION IN THE TEMPORAL AND NASAL SECTORS OF THE MONOCULAR VISUAL FIELD. Percept. mot. Skills, June 1965, 20(3)Part 2, 1037-1045. (Neurosurgical Unit, National Hospital, Maida Vale, London, England & Massachusetts Institute of Technology, Cambridge, Mass.).

A study comparing monocular visual spatial discrimination in temporal and nasal half-fields was undertaken with the Tuebinger perimeter of Harms (1960). 20 normal male college students performed a series of spatial visual discriminations in which "standard" and "comparison" stimuli were successively presented at varying distances from a fixation point along the mid-horizontal meridian. Each S made a total of 200 judgments. He was asked to state whether the comparison spot had appeared closer to or further from the fixation point than the standard spot. t-tests were performed on the percentages of correct responses. The results show that under conditions of relatively prolonged presentation of the test stimuli (1.0 sec.) monocular visual discriminations of this type are performed better with the left eye than with the right. The superiority of the left eye was maintained irrespective of whether nasal or temporal half-fields were tested. Furthermore, for a given eye, there was no significant difference in the performance of nasal and temporal half-fields.

R 13

25,617

Freedman, S.J., Hall, Sarah B. & Rekosh, J.H. EFFECTS ON HAND-EYE COORDINATION OF TWO DIFFERENT ARM MOTIONS DURING COMPENSATION FOR DISPLACED VISION. Percept. mot. Skills, June 1965, 20(3)Part 2, 1054-1056. (Tufts University, Medford, Mass.).

Comparisons were made between the compensations produced by sagittal and by transverse arm motions under equivalent conditions of exposure and test. 8 right-handed male Ss wore 20 diopter wedge prisms, 4 Ss had base left, 4 Ss base right prisms. Each S was exposed for 3 min. to each type of arm motion and tested with both types. Following exposure to sagittal motion the means of corrective shifts were 1.80 & 1.52 in. for the sagittal and transverse test motions. The corresponding mean shifts for the transverse motion are .95 & 1.54 in. Effects of exposure with sagittal motion generalize more to transverse than vice versa. The differences may be related to the greater precision of body midline judgments with sagittal motion.

R 5

25,618

Houck, Elaine V., Gardner, D.B. & Ruhl, Donna. EFFECTS OF AUDITORY AND VISUAL PRETRAINING ON PERFORMANCE IN A TACTILE DISCRIMINATION TASK. Percept. mot. Skills, June 1965, 20(3)Part 2, 1057-1063. (Iowa State University, Iowa City, Iowa.).

3 groups of children were compared for performance in a tactile discrimination task. Group A had received auditory pretraining; Group V had received visual pretraining; Group C received only familiarization with the room and apparatus. The basis of discrimination in all 3 modalities was "one" vs "two". Each of the 53 Ss was given a total of 40 tactile trials, and his score was the proportion of correct trials of this possible 40. Both visual and auditory pretraining facilitated performance in the tactile task. Visual pretraining was more effective than auditory, in its facilitating effects on tactile discrimination. Findings are not fully accounted for under the heading of learning set, suggesting the need for a more comprehensive theory of sensory integration. Problems in providing an adequate control experience with the apparatus without transfer of learning to the final task for Group C and problems of comparability of tasks in different modalities are discussed.

R 13

25,619

Taylor, M.M. NON-ADDITIVITY OF PERCEIVED DISTANCE WITH THE MUELLER-LYER FIGURE. Percept. mot. Skills, June 1965, 20(3)Part 2, p1064. (Defence Research Medical Labs., Toronto, Ontario, Canada).

4.23 in. "Feathers" of the Mueller-Lyer illusion without a connecting line between the dips and an equal-sized "Arrowhead" figure were drawn on separate sheets of paper. The interval between the points in each figure was divided by 6 small but clearly visible dots. 8 Ss estimated each possible inter-dot distance, and 7 of the 13 possible distances involving a point, twice for each figure. For intervals containing each possible number of interpolated dots, the numbers of cases are shown in which the "Arrowhead" figure gave a longer matching line than the "Feathers" and vice versa. The results indicate that it is impossible to infer the relations of large perceived distances from the relations of their component perceived distances, and hence that there is no single functional relationship (e.g., a power law) between perceived and physical distance. (HEIAS)

25,620

Benfari, R. & Vitale, P. RELATIONSHIP BETWEEN VERTICAL ORIENTATION IN THE ROD AND FRAME TEST AND IN A COMPENSATORY TRACKING TASK. Percept. mot. Skills, June 1965, 20(3)Part 2, 1073-1080. (Research Dept., Grumman Aircraft Engineering Corporation, Bethpage, N.Y.).

12 selected naval aviators were given the Rod and Frame Test and were run through an experimental test involving a compensatory tracking task that had 2 conditions of proprioceptive feedback (kinetic and static). 5 Ss, classified as "body oriented," on the Rod and Frame Test, had a lower RMS roll score on the compensatory tracking than 5 Ss classified as "frame oriented." In addition to this finding, the Rod and Frame data of the aviator sample were compared to Witkin's & Asch's data of 1948. A striking similarity on both constant and average error was observed between Witkin's & Asch's sample and the present group. Explanation for the differences in performance under the 2 conditions of the tracking task for the 2 categories of Ss was offered in terms of perceptual style.

R 6

25,621

Smith, O.W. & Smith, Patricia C. AN ILLUSION OF SLANT IN NATURE. Percept. mot. Skills, June 1965, 20(3)Part 2, p1108. (Cornell University, Ithaca, N.Y.).

A spectacular example of an illusion of slant occurs when College Ave. at Cornell University is viewed from a particular observation point (OP). 25 adult Ss in daytime and 10 at night estimated its apparent slant in degrees. It was found that: a) all Ss were aware of a great discrepancy between the apparent and geographical slant of the avenue; b) no S had previously recognized the illusion. The modal estimate was 45°, with a range of 29 to 80°. The illusion is probably due to effects on perception of an interaction of cues for vertical and horizontal depths. (HEIAS)

R 1

25,622

McKittrick, K.G. BODILY ACTIVITY AND PERCEPTUAL ACTIVITY. *Percept. mot. Skills*, June 1965, 20(3)Part 2, 1109-1112. (University of South Florida, Tampa, Fla.).

This report describes the results of 2 studies designed to test the hypothesis that there is an inverse relation between bodily and perceptual activity. In Study I 100 college students' bodily movements were recorded by kymograph while they were tested for the autokinetic illusion, reversible figure-ground, Necker cube reversals, and visual figural aftereffects. No significant correlations were found between bodily movement and perceptual scores. Study II involved only autokinetic illusion scores and induced bodily activity of 200 Ss. Significant linear correlations were found in the expected direction, i.e., bodily movement correlated positively with autokinetic latency in both males and females; bodily movement was negatively correlated with extent of autokinetic movement in females. Female Ss in both studies showed significantly greater autokinetic latency than males.

R 11

25,623

Farrow, B.J., Santos, J.F., Haines, J.R. & Solley, C.M. INFLUENCE OF REPEATED EXPERIENCE ON LATENCY AND EXTENT OF AUTOKINETIC MOVEMENT. *Percept. mot. Skills*, June 1965, 20(3)Part 2, 1113-1120. (University of Texas, Austin, Tex.).

This study was designed to assess the influence of massed and spaced practice on the latency and extent of perceived autokinetic (AK) movement. 28 Ss in the spaced group were tested on 5 separate occasions following a constant level of dark adaptation, while Ss in the massed group were tested in 1 session with an increasing level of dark adaptation. The log-latency scores (time from onset of AK light to onset of AK movement) decreased across trials for both groups, while the log-distance scores (verbal estimates of extent of AK movement) increased for the massed group across trials but not for the spaced group. These results suggest methodological precautions which should be observed in subsequent studies where autokinesis is used to measure isolation and sensory deprivation effects and in those studies involving repeated AK trials.

R 14

25,624

Harcum, E.R. AN ISOLATION EFFECT IN PATTERN PERCEPTION SIMILAR TO THAT IN SERIAL LEARNING. *Percept. mot. Skills*, June 1965, 20(3)Part 2, 1121-1130. (College of William & Mary, Williamsburg, Va.).

The hypothesis was that the mechanisms involved in serial learning which produce the characteristic bowed curve of errors also operate in the perception of tachistoscopic patterns to determine the distribution of errors among element-positions. If the mechanisms are in fact the same, isolation of an element in a tachistoscopic pattern will alter the distribution of errors among elements in the same manner that isolation changes the bowed curve of serial learning. Since an isolation effect has not previously been found when 0 does not know of the isolation before the exposure, a postulate of the present experiment is that prior knowledge of the isolation is critical for the isolation effect. Therefore, in this study, in which 0 knew of the isolation before exposure of the pattern, it was predicted that there would be a relative decrease in errors for the isolated element. 20 Ss were used; they were not told the purpose of the experiment. Performance under isolated conditions was compared to the unisolated condition. A significant isolation effect was found ( $p < .001$ , binomial test) confirming the hypothesis.

R 32

25,625

Cameron, P. & Wertheimer, M. KINESTHETIC AFTEREFFECTS ARE IN THE HANDS, NOT IN PHENOMENAL SPACE. *Percept. mot. Skills*, June 1965, 20(3)Part 2, 1131-1132. (University of Colorado, Boulder, Colo.).

Kinesthetic figural aftereffects (KFAE) were measured in 44 Ss to determine whether satiation occurs in the hands or in phenomenal 3-dimensional space. KFAE of equal sign and magnitude occurred in the hands handling the satiation objects whether the arms were crossed or uncrossed during the satiation period. Therefore the satiation effect is in the hands, not in phenomenal space.

R 3

25,626

Cahoon, D.D. AN EASILY CONSTRUCTED REACTION TIME APPARATUS. *Percept. mot. Skills*, June 1965, 20(3)Part 2, 1139-1140. (US Veterans Administration Hospital, St. Cloud, Minn.).

2 methods of modifying a Standard Electric stop clock to serve as a reaction time device have been described. In 1 method an easily constructed control box is used to interrupt the power source of the clock. This approach leads to a less accurate apparatus than 1 constructed by wiring the control box into the clutch control circuit of the timer. However, the latter modification is more complicated and relatively permanent.

25,627

Dowling, R.M. VISUAL RECOGNITION THRESHOLD AND CONCURRENT MOTOR ACTIVITY. *Percept. mot. Skills*, June 1965, 20(3)Part 2, 1141-1146. (Catholic University of America, Washington, D.C.).

Recognition thresholds of the words push, pull and part were measured for 36 Ss under conditions of pushing, pulling, and no specific activity to test the hypotheses: a) that sensorimotor activity would have a threshold-lowering effect on words directionally related to the activity; and b) a threshold-raising effect for words not so related. The mean recognition thresholds for the test words were subjected to analysis of variance. Results supporting the first hypothesis were obtained and discussed as indicating a need for refinement of the generalized statement, based on previous research, that concurrent activity interferes with perceptual functioning. Failure to observe support of the second hypothesis was discussed as suggesting the need to consider, as well, the variable of the amount of physical activity involved.

R 17

25,628

Churchill, A.V. QUANTITATIVE TACTUAL-KINESTHETIC JUDGMENT. *Percept. mot. Skills*, June 1965, 20(3) Part 2, 1147-1148. (Defence Research Medical Labs., Toronto, Ontario, Canada).

The results of a previous experiment showed that a bilateral kinesthetic difference did not obtain when tactual-kinesthetic judgments were made with the left and right hands. The present experiment was designed to eliminate the possible contribution of visual and kinesthetic figural aftereffects to the directional bias of errors. The same 7 right-handed Ss were used as in the previous experiment by the author. 9 stimulus rods were presented in random order to the left and right hands alternately, and S was required to make quantitative judgments of the diameter of the rods to the nearest 1/16 in. The results confirm those reported in the 1961 study, in that 48.8% of the errors were made on left-hand judgments and 51.2% were made on right-hand judgments. Results indicate that performance was equivalent with the left and right hands.

R 4

25,629

Grossman, J.S. & Hallenbeck, C.F. IMPORTANCE OF TIME AND ITS SUBJECTIVE SPEED. *Percept. mot. Skills*, June 1965, 20(3) Part 2, 1161-1166. (Highland View Hospital).

The hypothesis was tested that persons who tend to judge time to be important also tend to experience time as passing swiftly. Earlier research has demonstrated that elderly persons, to whom time is presumed to be quite important, prefer faster images to describe time's passage than do young adult Ss. In this study, 39 young adults were instructed to value accuracy in performing a problem-solving task, while 40 other young adults, matched for age, education, and IQ, were instructed to value speed in performing the same task. The 2 groups did not differ in subjective speed of time, as measured by the "Time Metaphor Scale." If the validity of the present methods is accepted, it is necessary to conclude from these results that the importance of time is not directly associated with its subjective speed. Direct estimations of 4 brief time intervals were also obtained from the 40 Ss instructed to value speed over accuracy. Within this group, persons who tended to over-estimate objective time also tended to prefer slower, more static images to describe the passage of time. This latter finding was discussed in terms of the deceleration of an internal chemical clock as originally proposed by Hoagland.

R 4

25,630

Rosentswieg, J. THRESHOLD PERCEPTION OF THE MOTOR SKILLED. *Percept. mot. Skills*, June 1965, 20(3) Part 2, p1182. (Texas Woman's University, Denton, Tex.).

183 Ss participated in a study to determine whether threshold levels of sensory perception in audition, balance, kinesthesia, pressure and vision differed significantly between motor skilled and unskilled Ss. Ss scoring in high and low quartiles on the Iowa Revision of the Brace Motor Ability Test, were selected as the skilled and unskilled Ss, respectively. Each S was tested individually to determine his threshold level of perception in each modality. Apparatus permitted discrimination among Ss, although no equipment provided true absolute threshold values. Sensory adaptation time was provided for all the tests, and all instrument movements were paced by a metronome. 5 successive trials in each modality were given: highest and lowest scores were eliminated. The mean score for each modality except audition at 6000 cps tended to favor the motor skilled, but not was significant. A Sign test indicated that 6 out of 7 measures were significant ( $p < .05$ ): 2 in audition, and 1 each in balance, kinesthesia, pressure and vision. It was concluded that the absolute level of perceptual threshold, as measured here, was not a critical factor in the motor performance of these male high school aged Ss.

R 1

25,631

Rossi, A.M. & Solomon, P. NOTE ON REACTIONS OF EXTROVERTS AND INTROVERTS TO SENSORY DEPRIVATION. *Percept. mot. Skills*, June 1965, 20(3) Part 2, 1183-1184. (Harvard Medical School, Boston, Mass. & Boston City Hospital, Boston, Mass.).

11 extroverts and 7 introverts were scheduled for 2 sessions of sensory deprivation. During both sessions, Introverts produced more button-presses for a promised time-off reward, and they scored higher on a discomfort index derived from before-after self-ratings of well-being. Of the 5 Ss who did not complete the study, 3 were extroverts who quit during a session and 2 were introverts who quit between sessions. Interest in these results is attributed to their similarity to those obtained in a previous study by another investigator.

R 3

25,632

Chan, A. & Travers, R.M.W. EFFECT OF SENSE MODALITY SWITCHING ON SERIAL LEARNING. *Percept. mot. Skills*, June 1965, 20(3) Part 2, 1185-1191. (Educational Research Bureau, University of Utah, Salt Lake City, Utah.).

Previous research has indicated that, when a serial learning task involves switching sense modality, learning is depressed. The switching involves a period of about 200 msec., which is not a part of the time available for learning. In a serial learning task, with non-sense syllables, sense modality was switched from the auditory to the visual to the auditory or the reverse, but only 1 switch was involved in the 7-syllable list. The prediction was that a depression would be produced in the learning of the syllable following the switch and that the syllable involved in the switch would be influenced both by the von Restorff effect and by the reduction in time available for learning as a result of switching. 120 Ss were randomly assigned to 12 conditions of 10 Ss each. At the faster of 2 speeds some evidence was consistent with predictions.

R 4

25,633

Ballou, Susan R. & Corah, N.L. THE PHENOMENAL VERTICAL AND PERCEPTION OF CHANGE IN SPATIAL ORIENTATION. *Percept. mot. Skills*, June 1965, 20(3) Part 2, p1200. (Washington University, St. Louis, Mo.).

Corah (1965) investigated the effects of target starting position and visual field structure on perceived change in orientation of a rod target rotated at a speed below threshold for movement. The present study used the same apparatus. 8 conditions were presented to 96 Ss with the rod beginning at true vertical or the phenomenal vertical (PV) frame absent or present, and frame tilted or vertical if present. Neither the PV or direction of target rotation produced significant differences in perceived change of orientation. Frame-tilted conditions produced the greatest lag in detection and the greatest variability in judgments. The data support the hypothesis that the adaptation level becomes unstable under the tilted-frame conditions. (HEIAS)

R 2

25,634

Hochberg, I. EFFECT OF PREVIOUS LISTENING EXPERIENCE UPON SEMANTIC PERCEPTION OF SIMPLE AND COMPLEX TONES. Percept. mot. Skills, June 1965, 20(3)Part 2, 1201-1208. (New York University, New York, N.Y.).

The semantic judgments of 45 presumed naive and 20 sophisticated listeners were obtained by means of 18 semantic differential scales to 4 acoustic stimuli, 2 pure tones (250 & 4000 cps), and 2 complex tones (sawtooth and white noise), to determine whether previous familiarity with specific sounds affected their psychological perceptions. The 18 scales were culled from a pool of scales and randomly ordered with bipolar terms selected according to the following criteria: a) adjective pairs that described psychological correlates of physical parameters of sound; b) adjective pairs that described aesthetic judgments of sound; c) adjective pairs that described psycho-physiological reactions to sound; d) adjective pairs that described personal evaluations of sound. Results revealed that both naive and sophisticated listeners judged the auditory stimuli in a similar manner, but sophisticated listeners demonstrated more extreme responses. It was concluded that previous listening experience with specific acoustic signals affected the intensity of the psychological meaning evoked by these sounds, but not necessarily the direction of meaning.

R 13

25,635

Perry, N.W., Jr. & Copenhaver, R.M. DIFFERENTIAL CORTICAL HABITUATION WITH STIMULATION OF CENTRAL AND PERIPHERAL RETINA. Percept. mot. Skills, June 1965, 20(3)Part 2, 1209-1213. (University of Florida, Gainesville, Fla.).

It was hypothesized that discrete stimulation of central and peripheral retina would produce differential habituation of the evoked response. In previous studies of habituation of visually evoked responses only the entire retina had been stimulated. A xenon light of 10 $\mu$  sec. duration and subtending a visual angle of 2.5° was flashed at 3.8 cps. The normal right eye of a trained S was stimulated with 150 light flashes. The average response to these 150 flashes was considered as 1 evoked response and also as 1 trial. 20 consecutive trials were given in a session lasting approximately 25 min. The stimulus was presented centrally, 10° and 20° nasally on the horizontal meridian for 3 sessions each on 9 separate days. In addition, all 3 stimulus locations were presented for 14 trials each in a single session of 45 min. duration. A digital computer extracted and quantified cortical evoked potentials recorded from the scalp of the S. The habituation of potentials from stimulation of the central retina was compared with habituation of potentials from stimulation of 2 peripheral retinal areas. Habituation was more rapid to peripheral stimulation and also significantly greater. (HEIAS)

R 7

25,636

Hustmyer, F.E., Jr. & Burdick, J.A. CONSISTENCY AND TEST-RETEST RELIABILITY OF SPONTANEOUS AUTONOMIC NERVOUS SYSTEM ACTIVITY AND EYE MOVEMENT. Percept. mot. Skills, June 1965, 20(3)Part 2, 1225-1228. (New York State University, Downstate Medical Center, New York, N.Y.).

Spontaneous autonomic nervous system (ANS) activity (GSR) was recorded during rest, and frequency of horizontal eye movements was recorded during the viewing of 2 different dot patterns by 14 Ss. The same tasks were repeated after a 2- to 4-mo. period. ANS activity during rest was found to be quite consistent over time ( $\rho = .75$ ,  $p < .01$ ) as were eye movements. The within-session  $\rho$  between eye movements on the patterns was .30 (N.S.) for the first session and .76 ( $p < .01$ ) for the second session. The  $\rho$ s of eye movements obtained 2 to 4 mo. apart were .58 ( $p < .05$ ) for a 4-dot stimulus and .77 ( $p < .01$ ) for a 1-dot stimulus. When eye movements for the 2 conditions were combined,  $\rho$  was .78 ( $p < .01$ ) between the sessions separated by 2 to 4 mo.

R 5

25,637

Hammes, J.A. & Watson, J.A. BEHAVIOR PATTERNS OF GROUPS OF EXPERIMENTALLY CONFINED. Percept. mot. Skills, June 1965, 20(3)Part 2, 1269-1272. (University of Georgia, Athens, Ga.).

In a series of tests, behavior patterns of 2 30-person shelter occupancy groups were evaluated to determine effects of confinement for 2 weeks under conditions of austerity. Auster conditions included 8 sq. ft./person living space, water rations of approximately 1.5 qt./person/day, survival biscuit rations of less than 900 cal./person/day without adjuncts, and sleeping on a concrete floor covered only with 3/16 in. corrugated fiberboard. Os were assigned to one 4 hr. watch per day. Counts were made every 15 min. throughout each study of body positions (standing, sitting, and lying), and activities (sleeping, exercise, eating, recreation, training, conversation, and quiet). The purposes of frequency counts were: a) to establish a means of detecting the onset of fatigue, depression, and withdrawal symptoms for the group as a whole; and b) to provide an over-all picture of position and activities of the group throughout the occupancy. The parallel uniformity of the 2 groups in both measures suggested high reliability of measurement. Approximately half the confinement period was spent in the lying position, slightly over 1/3 of the time in the sitting position, and about 1/6 of the time in the standing position. The most time-consuming activities in order of magnitude were sleep, quiet reflection, conversation, and recreation. No adverse fatigue effect was observed. (HEIAS)

25,638

Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XIX. PSYCHOLOGICAL INDEX NO. 15, 1908. Percept. mot. Skills, June 1965, 20(3)Part 2, 1273-1276. (Montana State University, Bozeman, Mont.).

An alphabetical listing of 77 references to work in perception including 43 articles in German, 31 in English, and 3 in French is presented. (HEIAS)

25,639

Fleishman, E.A. & Fruchter, B. COMPONENT AND TOTAL TASK RELATIONS AT DIFFERENT STAGES OF LEARNING A COMPLEX TRACKING TASK. Percept. mot. Skills, June 1965, 20(3)Part 2, 1305-1311. (American Institutes for Research, Washington, D.C. & University of Texas, Austin, Tex.).

Practice on a 3-dimensional complex tracking task was given to 203 Ss for 17 sessions extending over a period of 6 wk. Measures of 3 component performances (azimuth, elevation, and sideslip errors) and 2 total-performance criterion scores (integrated error and "time on target") were obtained. The intercorrelations of these 5 measures at 10 critical stages along the learning curve were computed. The resulting 50x50 matrix of intertrial and inter-measure correlations was factor analyzed. The differential factor patterns, representing different combinations of part-whole relationships, provided insights into the skill-learning process at different stages of practice, and identified components related to eventual proficiency on the task.

R 10

25,640

Nickerson, R.S. RESPONSE TIME TO THE SECOND OF TWO SUCCESSIVE SIGNALS AS A FUNCTION OF ABSOLUTE AND RELATIVE DURATION OF INTERSIGNAL INTERVAL. Percept. mot. Skills, Aug. 1965, 21(1), 3-10. (USAF Decision Sciences Lab., Hanscom AFB, Mass.).

An experiment was conducted to determine whether both the absolute and the relative duration of the  $S_1$ - $S_2$  interval would affect the response time to the second of two successive signals ( $RT_2$ ) separated by an interval of brief but variable duration. 4 Ss completed 7 sessions under each of 4 conditions. A session consisted of 50 trials on each of which there occurred 2 nonsimultaneous visual signals. S's task was to press a telegraph key in response to the second signal of each pair; no response was required to  $S_1$ . The termination of  $S_1$  was coincident with the onset of  $S_2$ ;  $S_2$  was terminated by S's response. The independent variable was the duration of the  $S_1$ - $S_2$  interval. During an experimental session interval of 5 different durations each occurred 10 times. The 4 conditions were identical in all respects except for the durations of the intervals used. These ranged in 100-msec. steps from 100-500 msec., 300-700 msec. and 500-900 msec. in Conditions 1, 2, 3, respectively. In condition 4 the interval ranged in 200 msec. steps from 100-900 msec. This allowed for comparisons between  $RT_2$ s obtained with intervals of the same absolute but different relative durations, and conversely, with the same relative but different absolute durations. Under these conditions,  $RT_2$  varied inversely with both the absolute and the relative duration of interval over the range of intervals generally associated with psychological refractory period. (HEIAS)

R 14

25,641

Dooley, R.P. & Newton, J.M. TRANSFER OF TRAINING BETWEEN QUICKENED AND UNQUICKENED DISPLAYS. Percept. mot. Skills, Aug. 1965, 21(1), 11-15. (American Institute for Research, Pittsburgh, Penn. & University of Omaha, Omaha, Neb.).

Transfer effects between quickened and unquickened displays were assessed in terms of system error rather than the displayed error used in a previous study (Holland & Henson, 1956) (HEIAS 6076). 12 Ss were divided into 2 groups of 6, the task was compensatory tracking with second-order control. Ss were required to operate a spring-restrained joystick free to move laterally from the center; each group received 100 1-min. learning trials on 1 display and then was switched to the other display for 5 trials. In both cases, transfer was positive but incomplete, a confirmation of Holland & Henson's findings. However, initial practice with the unquickened display was characterized by high performance variability, and this was not significantly reduced by previous practice with the quickened display.

R 6

25,642

Leckart, B.T. & Bakan, P. COMPLEXITY JUDGMENTS OF PHOTOGRAPHS AND LOOKING TIME. Percept. mot. Skills, Aug. 1965, 21(1), 16-18. (Ohio University, Athens, Ohio & Michigan State University, East Lansing, Mich.).

30 normal adult Ss viewed each of 30 color slides of real objects and places for as long as they wished. The stimuli had previously been rated on a 7-point scale of complexity and divided into 3 groups of 10 each representing 3 levels of complexity; high, low, and middle. 3 scores were obtained for each S: the total amount of time spent looking at pictures of high, low, and middle complexity. The mean looking times were 13.3, 11.0, and 7.0 sec., respectively showing that judged complexity of the stimuli is positively related to looking time. Results of an analysis of variance showed that complexity is significant. ( $CF=54$ ,  $df=2/29$ ,  $p=.01$ ). Individual comparisons between the high-medium difference and the medium-low difference show both differences to be significant ( $p=.01$ ). The between Ss variance is significant ( $CF=22$ ,  $df=2/29$ ,  $p=.01$ ), indicating individual differences in looking times. These results extend the generality of previous research on the relationship between complexity and visual exploration by showing that the relationship between complexity and looking time holds true for realistic photographs as well as for designs and line drawings.

R 9

25,643

Smith, L.A. INDIVIDUAL DIFFERENCES IN MAXIMAL SPEED OF MUSCULAR CONTRACTION AND REACTION TIME. Percept. mot. Skills, Aug. 1965, 21(1), 19-22. (University of Iowa, Iowa City, Iowa.).

50 college men participated in an investigation of the relationship between standing RT and the maximal vertical velocity which the body can generate while in contact with the ground. In response to a stimulus light which was randomly activated at intervals of 1-4 sec., S, who was standing erect on the platform, propelled his body vertically as rapidly as possible. Prior to and during the jump S used no arm action. The action of S's feet leaving the spring-loaded RT platform stopped a standard S.1: .01 sec. timer. As RT was defined as that interval of time elapsing between the onset of the stimulus and the first overt movement, a light strip of wood was strapped behind S's knee joint which kept the legs extended prior to and during the jump. The nonsignificant correlation of  $-0.31$  indicates that vertical body speed cannot be predicted from a knowledge of standing RT.

R 11

25,644

Fehrer, Elizabeth. CONTRIBUTION OF PERCEPTUAL SEGREGATION TO THE RELATIONSHIP BETWEEN STIMULUS SIMILARITY AND BACKWARD MASKING. Percept. mot. Skills, Aug. 1965, 21(1), 27-33. (Brooklyn College, Brooklyn, N.Y.).

The present study is a variation, incorporating an essential control, of an earlier study, in which it was shown that backward masking (metamask) is a direct function to the similarity between test and masking stimuli. The test stimuli were rows of 4 letters. 2 series of masks were used: a) 8 parallel straight lines, 2 bounding each of the letters; and b) outline boxes, each surrounding 1 of the letters, and grids. Similarity was defined in terms of the ratio of mask to letter size. Letter size remained constant. The line masks varied from 5/6 to 20 times letter height. With the box-grid series, 3 ratios of mask to letter size were produced by incorporating the boxes into 2 grids of increasing complexity. It was shown with both series of masks that letter identification was most difficult with the most similar masks, i.e., the shorter of the line masks and the boxes of the box-grid series. The fact that the short lines masked more effectively than the long ones may simply have been due to the fact that it was harder to isolate or segregate the letters from the similarly sized lines. In order to separate the contribution of such a potential perceptual confusion factor, it was necessary, as a control, to present the letters simultaneously with the masks. This experiment confirms the earlier finding that similarity in size between test and masking stimuli is directly related to the extent of backward masking. In addition, it is shown that this relation is in part due to the greater difficulty in perceptually segregating test from mask when these are similar in size. The remainder of the effect, however, seems attributable to a retroactive masking effect that varies directly with stimulus similarity.

R 6

25,645

Rosner, B.S. THE POWER LAW AND SUBJECTIVE SCALES OF NUMBER. Percept. mot. Skills, Aug. 1965, 21(1), p42. (University of Pennsylvania, Philadelphia, Penn.).

Ekman (1964) (HEIAS 24,425) has offered a derivation of the psychophysical power law from Fechner's conjecture of a logarithmic relationship of subjective magnitude to stimulus intensity. The derivation assumes that Fechner's "law" describes subjective responses to numbers as well as reactions to conventional prothetic domains. Thus, argues Ekman, magnitude estimation requires S to match subjective impressions of the stimuli under test to his interval scale of number. The equation of 2 logarithmic functions produces mathematically a power relationship between their arguments. The author poses the problem raised by Ekman in a more general form and asked whether subjective responses to number distort magnitude or category scales in any fashion. In an informal experiment Ss were instructed to scale numbers by magnitude estimation in the following manner: "This is an experiment to test your reactions to numbers. Whenever I say the number '37', you must respond with '83'. If I say a number that seems about half as large as 37, you must say 42. In other words you should reply with a number which bears the same proportion to 83 as the number I say bears to 87." I E then read a random, replicated sequence of numbers at a rate of about 1 every 2 sec. Another E wrote down S's replies. Then, after receiving appropriate instructions, S quickly rated numbers on a 7-point category scale. At the end of the experiment, each S felt that the task was fairly easy. Neither the magnitude estimates nor the category ratings gave any indication of non-linear subjective responses to number. Ekman's theory could account for the linear magnitude estimates. If number were a prothetic continuum, however, the category ratings should have been non-linear and they were not. The simplest interpretation of the results in that Ss have a nicely linear subjective scale of number. Acceptance of this interpretation implies rejection of Ekman's derivation of the power law from Fechner's conjecture.

R 1

25,646

Miller, G.D., Anderson, D.A. & Simonson, E. FOVEAL FLICKER FUSION USING A MOVING STIMULUS. Percept. mot. Skills, Aug. 1965, 21(1), 43-51. (University of Minnesota, Minneapolis, Minn.)

The relationship between stimulus velocity and the critical-flicker-fusion frequency (CFF) of an intermittent visual stimulus was investigated by modulating the sweep-speed and intensity of an oscilloscope beam. When Ss (16) fixated upon a stationary point, CFF showed an approximately linear increase as a function of velocity. Velocity did not, however, influence CFF when S fixated on the moving stimulus. The multiple correlation (.68) between CFF determinations obtained with a stationary stimulus vs those obtained with several different velocities implies that the same mechanisms which determined CFF under the former condition were also operative in the latter. The trend of the bivariate correlations between the average CFF values for isolated pairs of experimental conditions suggests that an additional factor, possibly spatial acuity, may have become progressively dominant as velocities exceeded 1.08°/sec.

R 17

25,647

Arima, J.K. PERFORMANCE OF NORMAL MALES ON THE HALSTEAD TACTUAL PERFORMANCE TEST UNDER SEVERE ENVIRONMENTAL STRESS. Percept. mot. Skills, Aug. 1965, 21(1), 83-90. (USA Combat Developments Command Experimentation Center, Ft. Ord, Calif.).

Normal soldiers undergoing demanding field maneuvers of varying severity were administered the Halstead Tactual Performance Test (TPT) under rigidly controlled conditions to determine the learning function underlying 3 administrations of the test, as is customary in diagnostic testing, and to evaluate the effects of environmental stresses on performance. A control group was not subjected to the stressful conditions. Results showed that differing levels of environmental stress did not affect performance. A strong linear trend described the learning function. Letting  $X=1, 2, 3$  (repeated administrations) and  $Y=$  minutes to complete the test, a least squares fit gave the equation  $Y=8.48-1.69X$ . Of 75 Ss, 7 failed to complete the test in 10 min. on the first testing, 4 on the second testing (only 1 repeat failure) and none failed on the third testing. A dramatic reduction of variability among Ss on the first and second testings suggests that initially poor performance on the TPT may be related to factors other than impairment of the tactual sense modality, but inability to complete the test in 10 min. on the third trial would be distinctly abnormal.

R 7

25,648

Elias, M.F., Snadowsky, A.M. & Rizy, E.F. IDENTIFICATION OF TELEVISED SYMBOLS AS A FUNCTION OF SYMBOL RESOLUTION. Percept. mot. Skills, Aug. 1965, 21(1), 91-99. (USAF Display Techniques Branch, Griffiss AFB, N.Y.).

2 experiments were performed to determine the effect of symbol resolution on speed and accuracy of identification of televised letters and numbers. Ss viewed 36 symbols 10 times under 9 conditions of symbol resolution (3 to 11 scan lines per symbol), and under a solid-symbol (non-televised) control condition. For most symbols, accuracy of identification seriously deteriorated below 5 lines. Speed performance showed a progressive improvement from 5 to 11 lines but did not reach a level obtained with solid symbols. It was concluded that 11 lines approaches an optimal level of resolution, and that reduction in symbol resolution much below 11 lines should be approached with caution.

R 4

25,649

Doolittle, T.L. & Logan, G.A. A DEVICE FOR MEASURING SIMULTANEOUS FLEXION STRENGTH OF BOTH WRISTS. Percept. mot. Skills, Aug. 1965, 21(1), 121-122. (California State College, Los Angeles, Calif. & Southwest Missouri State College, Springfield, Mo.).

The use of cable tension methods to ascertain the strength of muscle groups is now widely accepted. In many research studies a cable tensiometer has been used to determine muscular strength, however, the writers could find no accepted method to measure the flexion strength of both wrists simultaneously. A device was therefore designed on which a cable tensiometer was utilized to measure the simultaneous flexion strength of both wrists. A description of the device, including the necessary information for its construction and an illustration is presented. 50 Ss were employed in a test-retest experimental design. Ss were tested on 2 days with 3 trials each day. The highest score of the 3 trials was utilized for the test-retest comparison. 7 Ss had identical scores while 8 varied only 1 unit on the cable tensiometer (less than 2 lbs.) for the 2 tests. It was concluded that the device, when employed as described, is reliable.

R 4

25,650

Beck, J. & Shaw, W.A. MAGNITUDE OF THE STANDARD, NUMERICAL VALUE OF THE STANDARD AND STIMULUS SPACING IN THE ESTIMATION OF LOUDNESS. *Percept. mot. Skills*, Aug. 1965, 21(1), 151-156. (Harvard University, Cambridge, Mass. & University of Pennsylvania, Philadelphia, Penn.).

2 studies are reported. Study I which investigated the effects of the magnitude of the standard with respect to the standard and the spacing of the loudness stimuli consisted of 10 experiments each using 25 Ss. The stimuli were 1000-cps loudnesses spaced in 2 ways: a) approximately equal intervals on the lambda scale; and b) irregularly. The standard was set at the lowest, middle and highest loudness presented. The standards were 25, 77, & 101 db for the uniformly spaced stimuli and 25.81 & 101 db for the irregularly spaced stimuli. The loudnesses presented were 25, 35, 65, 70, 72, 85, & 101 db re .0002 dyne/cm<sup>2</sup>. Study II investigated several possible sources of bias and consisted of 3 experiments each using 25 Ss. The stimuli, again 1000-cps tones, were spaced at approximately equal lambda intervals. Their db values were the same as those in Study I. The procedure followed was the same except that Os were given instructions designed to minimize biases due to the absolute subjective magnitudes of loudnesses and numbers. The results indicate that: a) the magnitude and numerical value of the standard may have marked effects on the judgment of loudnesses; and b) the distributor of the stimuli does not produce notable effects in the over-all form of the loudness function.

R 8

25,651

Gulo, E.V. & Baron, A. CLASSROOM LEARNING OF MEANINGFUL PROSE BY COLLEGE STUDENTS AS A FUNCTION OF SENSORY MODE OF STIMULUS PRESENTATION. *Percept. mot. Skills*, Aug. 1965, 21(1), 183-186. (University of Maine, Orono, Maine & University of Wisconsin, Milwaukee, Wisc.).

A classroom experiment was performed to determine whether auditory or visual presentation of meaningful material is more efficient in producing learning. Prose material was presented to 4 groups of college students, either visually, by giving each S a mimeographed copy of the material to read, or in the auditory modality, or through a radio, a fifth (control) group read material irrelevant to the subsequent retention test. A multiple-choice retention test indicated that with presentation time the same for all Ss, direct reading of the material (visual) produced retention levels that were higher, than those for the 3 auditory methods of presentation. This result was explained in terms of the greater practice opportunities available to the direct reading group and the visual nature of the retention test. The absence of systematic differences among the 3 auditory groups suggested that when the only necessary channel of communication is auditory the incidental stimulation provided by the sight of the person making the presentation does not increase learning efficiency.

R 3

25,652

Borghi, J.H. DISTRIBUTION OF HUMAN REACTION TIME. *Percept. mot. Skills*, Aug. 1965, 21(1), 212-214. (US Veterans Administration Hospital, Palo Alto, Calif.).

The attempts of Stroud & McGill to specify the distribution of human reaction times are discussed. In this study more than 4,000 visual RTs were collected for one S over a period of 5 months. The S was highly practiced in making RT responses. A visual discriminator provided both stimulus and fixation sources. The flash stimulus was provided by a Sylvania Glow Modulator having a rise and decay time of less than 0.0001 sec. 2 sets of filters were employed in order to obtain 2 separate distributions. Observation was foveal. The stimulus duration was always .003 sec. and S was informed of her time after each reaction. S was dark adapted for 30 min. before the trials began. Each daily session contained 80 reaction times under the 2 filter densities and this was later reduced to 40. A normal distribution was approximated for the particular sensory-motor line studied.

R 4

25,653

Dunn, B.E., Gray, G.C. & Thompson, D. RELATIVE HEIGHT ON THE PICTURE-PLANE AND DEPTH PERCEPTION. *Percept. mot. Skills*, Aug. 1965, 21(1), 227-236. (University of Minnesota, Minneapolis, Minn.).

Geometric considerations of the 2-dimensional projection of the 3-dimensional visual field led to hypotheses about the possible effect on depth perception of: relative height in the picture plane, the type of supplied reference plane, and angle of regard. In 3 experiments 50 Ss, divided into groups of 15, 15, and 20, viewed pairs of equidistant horizontal rods in front of 1 of 4 backgrounds, with either an upward or downward angle of regard. The results confirm the hypothesis that relative height can operate to influence depth perception, that the type of background influences depth perception in the predicted direction, and that a response set resulting in a tendency for Ss to see higher objects as farther irrespective of the reference plane also occurs. The effects of angle of regard and of degree of vertical separation were not completely elucidated.

R 10

25,654

Kaplan, I.T. & Carvellas, T. SCANNING FOR MULTIPLE TARGETS. *Percept. mot. Skills*, Aug. 1965, 21(1), 239-243. (New York University Medical Center, New York, N.Y.).

Scanning for a well learned set of targets is just as fast as scanning for only 1 target. Most reports indicate that scanning time is never proportional to the number of targets: in 1 task even on the first day, 10 targets took only 2 1/2 times as long as 1 target. However, the earliest data were collected after S had already practiced searching for the targets, so the initial relation of targets was not determined. The purpose of this study was to test the generality of the hypothesis that scanning time for just-learned targets increased in proportion to the number of targets being searched for. 4 Ss were used. S scanned a list of random letters looking for 1 to 5 target letters, which were read to him just before the list was presented. His scanning rate was estimated from a graph of the time required to find a target at different positions in the list. The more targets S was seeking, the more slowly he scanned. The time spent processing each non-target letter in the list increased in direct proportion to the number of targets for which S was searching.

R 4

25,655

Lamb, J. & Kaufman, H. INFORMATION TRANSMISSION WITH UNEQUALLY LIKELY ALTERNATIVES. Percept. mot. Skills, Aug. 1965, 21(1), 255-259. (University of Connecticut, Storrs, Conn.).

Previous investigators have concluded that the linear relation between reaction time (RT) and transmitted information found for equally likely stimuli (ELA) does not hold for unequally likely stimuli (ULA). However, the possibility still exists that a correspondence can be found by the use of a subjective probability measure. Accordingly, 9 Ss were run on a choice-RT task under conditions of both ELA & ULA stimuli. The apparatus consisted of a S's panel, and E's timer and control panel. S's panel contained 9 lights arranged in a semi-circle 14 in. in diameter; another semi-circle 2 in. smaller in diameter contained 9 response buttons. A trial commenced when S pushed the home key causing 1 stimulus lamp to light and the timer to start. The trial ended when S pressed a button, extinguishing the light and stopping the timer. The use of subject initiated trials eliminates a source of possible error present in previous studies. In the ELA condition there were 5 different numbers of alternatives: 2, 4, 6, 8, & 9 stimulus lights. In the ULA conditions 2 stimuli were always used but the relative frequency of their occurrence varied, viz., 90/10, 80/20, 70/30, & 60/40. In each session (1 condition) there were 125 trials. Ss were told the relative frequency of occurrence of the stimuli before each session. The results for the ULA data not only do not support the experimental hypothesis but are completely at variance with previous results.

R 5

25,656

Miller, R.A., Meyer, S.W. & Mader, R. RESEARCH STUDY OF THE BIOMEDICAL ASPECTS OF AEROSPACE SYSTEMS ENVIRONMENTAL CHAMBER MARK I. PHASE IV. MAN RATING RESEARCH STUDY, VOLUME I. Contract AF 40(600) 1012, Proj. 7778, AEDC TR 65 179, Aug. 1965, 53pp. USAF Arnold Engineering Development Center, Arnold AFB, Tenn. (Missile & Space Div., General Electric Company, King of Prussia, Penn.). (AD 465038)

This report presents the results of a Man Rating Research Study on the AEDC Mark I Aerospace Systems Environmental Chamber. The purpose of the study was to determine the modifications and additions that must be performed on the chamber and its support facilities in order to permit testing of manned vehicles or shelters. Study areas were concerned mainly with establishing the support criteria, operational sequences, rescue concepts and manpower requirements that are necessary to permit continuous testing over extended time periods. Subsequent to this phase of the program, these study results were utilized as a basis for establishing detailed criteria that will permit the evolution of detail designs for the actual "man-rating" hardware. These detailed criteria are presented in a separate report. (HEIAS 25,821).

R 3

25,657

Dimond, S.J. STORAGE OF INFORMATION ABOUT TIME. Percept. mot. Skills, Aug. 1965, 21(1), 261-262. (Trinity College, Dublin, Ireland).

An experiment is described in which the detrimental effects of an auxiliary tactual task on reaction time to periodically presented light stimuli were studied. RT stimuli were presented periodically to 1 group of 20 Ss throughout the experiment and aperiodically to another 20 Ss. During the first half of the experiment both groups performed the RT task while simultaneously performing a key-pressing task, then both groups performed the RT task only. When performing the RT task only, the RTs of the "periodic" group initially were of the same magnitude as those of the "aperiodic" group but on subsequent periodic trials the RTs became significantly shorter. The tactual task caused considerable interference in the performance of the RT task. The results support the hypothesis that ability to gauge the time separating periodically occurring RT stimuli is impaired when S is required simultaneously to perform an auxiliary task.

R 2

25,658

Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XX. PSYCHOLOGICAL INDEX, NO. 16, 1909. Percept. mot. Skills, Aug. 1965, 21(1), 287-290. (University of Montana, Bozeman, Mont.).

A bibliography of 116 items dealing with aspects of perception is presented. These were taken from the Psychological Index No. 16, 1909.

25,659

Roehrig, W.C. AN INSTRUMENT FOR ONE- OR TWO-DIMENSIONAL TRACKING. Percept. mot. Skills, Aug. 1965, 21(1), 307-312. (Psychiatry Dept., Columbia University, New York, N.Y.).

A rugged electro-mechanical tracking apparatus of simple, low-cost construction is described. The apparatus can be used for 1-dimensional tracking by connecting only the longitudinal motor, thus forcing the target to move back and forth in either simple sinusoidal motion or according to the sum of 2 or 3 sinusoids. The relative phases of the 3 sinusoids can be rapidly altered, as can the amplitudes (within limits) of each of the sinusoids. The frequency of the sinusoids can be changed either independently or conjointly. By also connecting the cross-feed motor, an essentially unpredictable target path in 2 dimensions is obtained, and this path can be rapidly altered by changing cams, and/or frequency, amplitude, and phase of the sinusoids. Movement of the cursor is by low, constant torque lathe-type controls. The distance the cursor moves per each rotation of the controls, can be altered for either or both of the controls. A continuous error signal is generated which is directly proportional to the distance the cursor is off target in any direction.

R 2

25,660

Haralson, J.V. AN APPARATUS FOR VARYING SIZE OF RECTANGLES CONTINUOUSLY AND PROPORTIONALLY. Percept. mot. Skills, Aug. 1965, 21(1), 313-314. (California State College, Los Angeles, Calif.).

In classroom experiments in visual perception one occasionally wishes to vary continuously the size of a rectangle while holding shape proportionally constant. This is difficult or expensive to accomplish because of the necessity of varying simultaneously and at different rates the length and width of the stimulus. This can be accomplished with an investment of about \$10.00 worth of materials and a few hours of labor. A simple apparatus with which size of rectangles can be continuously varied while holding ratio of base to altitude constant is fully described and illustrated.



25,661

Ammons, R.B. & Ammons, Carol H. MOTOR SKILLS BIBLIOGRAPHY: XLIV. PSYCHOLOGICAL ABSTRACTS, 1964, VOLUME 38, FIRST HALF. Percept. mot. Skills, Aug. 1965, 21(1), 315-318. (University of Montana, Bozeman, Mont.).

This bibliography includes an alphabetical listing of 99 articles on motor skills.

25,662

Bokander, I. TIME ESTIMATION AS AN INDICATOR OF ATTENTION-AROUSAL WHEN PERCEIVING COMPLEX AND MEANINGFUL STIMULUS MATERIAL. Percept. mot. Skills, Aug. 1965, 21(1), 323-328. (Lund University, Lund, Sweden).

The covariation between time estimation and simultaneous perception of visual stimuli chosen to evoke different amounts of attention-arousal was studied. The 4 stimulus pictures were black and white photographs. 2 of the stimuli (A & C) were chosen as having greater attention value or arousal potential. The pictures were always projected in the following order: A, D, B, A, C, B, D, C, A, D, B, A, C, B, D. 19 Ss were instructed to press a button to project a picture on the screen and to release the button when they thought that 7 sec. had elapsed. Pictures with high attention-value or arousal potential slowed the conscious interval clock as compared with more neutral pictures. The loss of attention-value in the loaded pictures after prolonged confrontation could be observed Ss' time estimations. At the end of the experimental session the difference between pictures with initially different attention-values disappeared in the time estimations.

R 3

25,663

Bernstein, I.H., Siegel, E.M. & Segal, E.M. ABSOLUTE JUDGMENTS UNDER THREE VIEWING CONDITIONS. Percept. mot. Skills, Oct. 1965, 21(2), p358. (Arlington State College, Arlington, Tex.).

24 undergraduate Ss made 60 absolute judgments at 7-ft & 10-ft distances in addition to the 3 ft employed by Eriksen (1959). Zero-order correlations were computed among S, V, and L for each S in each viewing condition. From these correlations, partial correlations, and the multiple R,  $R_{S,vm}$ , were computed for each S. The principal findings arose from an analysis of variance of the  $Z'$  transformed partial correlations (response channels by viewing distances by Ss). The results supported Eriksen's findings in that the verbal channel was superior to the motor channel ( $F=8.83$ ,  $df=1/23$ ,  $p<.001$ ) although both were significantly greater than zero at the .001 level. In addition, the interaction of response channels by viewing conditions was a significant source of variation ( $F=3.39$ ,  $df=2/46$ ,  $p<.05$ ) produced by the tendency of the V to increase and L to decrease in accuracy with increasing view-distance. The main effect of viewing distances was not significant ( $F<1.00$ ,  $df=2/46$ ). Likewise, analysis of the  $Z'$  transformed values of  $R_{S,vm}$  showed these values did not differ significantly ( $F<1.00$ ,  $df=2/46$ ); the mean values of  $R_{S,vm}$  were .96 over all viewing conditions. These latter two findings suggest that the interaction arose from response rather than perceptual factors.

R 1

25,664

Klipple, A.G. & Abrams, A.J. EFFECTS OF AMBIGUOUS TRAINING MATERIALS ON CUE DISCRIMINATION. Percept. mot. Skills, Oct. 1965, 21(2), 359-365. (USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif.).

A test was made of the hypothesis that Ss who are required to discriminate highly ambiguous sonar pip shapes early in training will be less accurate in discriminating unambiguous pip shapes following training than will Ss who are not required to attempt these difficult discriminations. 28 male college students were used as Ss: 14 were trained on ambiguous materials and 14 were trained on unambiguous materials. Results indicate that Ss trained on ambiguous materials were less accurate in judging unambiguous pip shapes than Ss trained on unambiguous materials. There was no difference between groups in the judgment of ambiguous pip shapes.

R 4

25,665

Stasiak, E.A. MONOCULAR STEREOSCOPIC PERCEPTION OF DISPARATE IMAGES. Percept. mot. Skills, Oct. 1965, 21(2), 371-374. (Lakeshore Psychiatric Hospital, New Toronto, Ontario, Canada & University of Waterloo, Waterloo, Ontario, Canada).

20 Ss were presented stereograms alternately to 1 eye. In a range of alternation rates of 2.1 to 10.0 cps with a mean of 5.5 cps, 18 Ss reported perception of stereoscopy. Due to retinal interactions between the 2 views the scene was also seen as vibrating. This phenomenon is important both to the question of the relation between monocular movement parallax and binocular stereopsis and to the theory of a binocular cyclopean field (Hochberg, 1964).

R 7

25,666

Siegenthaler, B.M. & Hochberg, I. REACTION TIME OF THE TONGUE TO AUDITORY AND TACTILE STIMULATION. Percept. mot. Skills, Oct. 1965, 21(2), 387-393. (Pennsylvania State University, University Park, Penn. & New York University, New York, N.Y.).

Measures of reaction time of the tongue to tactile stimulation on the lips and to a 1000-cps tone at sensation levels of 10, 50, & 70 db were obtained from 26 normal young adults. Results revealed that tactile stimulation evoked the shortest reaction time ( $M=.123$  sec.); 70 db elicited slightly longer reaction time ( $M=.129$  sec.); 50 db still longer reaction time ( $M=.137$  sec.); and 10 db the longest ( $M=.209$  sec.). The 10-db tone reaction time was significantly longer than that of any other stimulus condition, while tactile stimulus reaction time was significantly shorter than both the 10- and 50-db tonal stimuli, but not than the 70-db stimulus. Among the auditory conditions, 50 & 70 db were not significantly different from one another, but both were different from 10 db. The findings support the role played by tactual feedback in the oral region for monitoring speech. It is hypothesized that a speech mechanism which operates on a servosystem principle is likely to utilize the most efficient sensory channels available in monitoring speech output, with time of response being one important measure of efficiency.

R 10

25,667

Haines, J.R., Santos, J.F. & Farrow, B.J. STABILITY OF THE AUTOKINETIC PHENOMENON. *Percept. mot. Skills*, Oct. 1965, 21(2), p394. (Menninger Foundation, Topeka, Kan.).

Most studies reporting high reliability of the autokinetic (AK) effect have emphasized identical test-retest situations and have generally employed short intertrial intervals. The present report summarizes results obtained from Ss employed in 3 different experiments in which AK trials differed with respect to Es, intensity of the light source, experimental situations, and intertrial intervals. 22 Ss were instructed to observe a small, dim point of light which might or might not appear to move. If the light appeared to move S was instructed to draw its course of movement on a 22-in. x 28-in. sheet of paper, to indicate when the light stopped by a heavy dot, and to return to the center and then continue drawing if the pencil touched the edge of the drawing board. Ss observed the AK light for 10 min. in all sessions. Test Sessions I & II were identical with the exception that Es were different. The third session differed from the other 2 with respect to Es, a considerable smaller experimental room, and use of a brighter light source (.0006 ft-c. compared to .0001 ft-c.). The intertrial interval between Sessions I & II was 6 mo. and between Sessions II & III, 1 mo. The following were measures obtained from the AK tracings: total length of line (LL), maximum distance from center (DC), number of stops (NS). Spearman rank order coefficients (rhos), corrected for ties, were calculated for various scores between the 3 AK trials. The correlations between sessions for the LL scores were significant. The rhos for the DC and NS scores were also significant. Although the various measures were significantly correlated across sessions, when Friedman analyses of variance were applied to the data significant differences between sessions were found for the LL & DC scores but not for the NS scores. The above results indicate that an individual's performance will maintain its rank order within the group even though the experimental conditions vary across sessions. The present results strengthen the notion of intrasubject stability of AK perception. R 4

25,668

Weiss, W. INFLUENCE OF AN IRRELEVANT STIMULUS ATTRIBUTE ON NUMEROSITY JUDGMENTS. *Percept. mot. Skills*, Oct. 1965, 21(2), p404. (Hunter College, New York City University, New York, N.Y.).

The absolute judgment of a stimulus depends in part on the contextual set of other stimuli to which it is perceived to be similar. To test the assumption that customary principles of judgment will be impaired to the extent that irrelevant variables affect this sense of relatedness, a number of numerosity judgment experiments were conducted in which 1 or 2 of the stimulus attributes were irrelevant but cut across the dimension of similarity. Ss made relative numerosity judgments of the number of small filled circles or A's (ranging from 12 to 160) on an ascending set of 10 cards. Form and/or color were the irrelevant attributes and several variations were employed: e.g., the circles on cards 1-5 were all one color, those on cards 6-10 were another color; or one color for cards 1, 2, 4, 6, 8 with the other color on the remaining cards, etc. The results over all the variations were consistent: in no instance were the absolute judgments affected by the irrelevant dimension(s). (HEIAS)

R 2

25,669

Sanders, A.F. PREWARNING SIGNAL ACTIVITY AND RT AS A FUNCTION OF FOREPERIOD. *Percept. mot. Skills*, Oct. 1965, 21(2), 405-406. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

Simple auditory RT was measured as a function of foreperiod and reading activity before the warning signal (W) arrived. Without prewarning signal activity earlier results were confirmed, showing a continuous decrease of RT with smaller foreperiods. When reading activity preceded W, no significant difference was found between foreperiods of 0.5 to 4.0 sec., suggesting preparation for response before arrival of W at short foreperiods.

R 2

25,670

Roehrig, W.C. ADDITION OF CONTROLLED DISTORTION TO DELAY OF AUDITORY FEEDBACK. *Percept. mot. Skills*, Oct. 1965, 21(2), 407-413. (Biometrics Research Dept., New York State Department of Mental Hygiene, New York, N.Y. & Columbia University, New York, N.Y.).

In an attempt to determine what types of sensory information are processed by the feedback mechanisms used to monitor speech production, the accuracy and duration of the speech production of 22 Ss was assessed when auditory feedback was undelayed or delayed (.197 sec. delay), and undistorted or distorted, either by "infinite" peak clipping or by differentiation followed by "infinite" peak clipping and integration. It was found that the degree to which speech was disrupted under delayed auditory feedback (DAF) could not be accounted for by the intelligibility of the auditory feedback. The results suggested that speech was maximally disrupted under DAF when the auditory feedback not only was highly intelligible but also contained information about the amplitude variation of the effector output (speech).

R 8

25,671

Vanderplas, J.M., Sanderson, W.A. & Vanderplas, Janet N. STATISTICAL AND ASSOCIATIONAL CHARACTERISTICS OF 1100 RANDOM SHAPES. *Percept. mot. Skills*, Oct. 1965, 21(2), p414. (Washington University, St. Louis, Mo.).

This paper reports the construction, measurement and scaling of 1100 random shapes for use as stimuli in studies of perception and perceptual learning. 100 each of 4-, 6-, 8-, 10-, 12-, 14-, 16-, 18-, 20-, 22-, & 24-point shapes were constructed using Method I of Attneave & Arnoult (1956) (HEIAS 11,127). For each shape the following values were determined: number of inflections, area, perimeter, perimeter squared, the first 4 moments of the distributions of line lengths and interior angles, ratio of perimeter squared to area and maximum extent. The shapes were also scaled for association value and information content in a manner similar to that used by Vanderplas & Garvin (1959) (HEIAS 13,015), with the following variations in procedure: a) Ss were tested in groups of 3 to 5 rather than individually; b) shapes were projected on a screen 18x18 in. at a distance of about 8 ft.; c) responses were written; and d) a constant random sequence was used with counterbalancing of the 1st and 2nd 550 frames of the filmstrip. The Cartesian coordinates of each of the shapes as well as the associative responses and summary measures were punched into IBM cards for tabulation and for computation of the measures and scales. The coordinates and the summary measures and scales have been filed with the American Documentary Institute. The associative responses are in the form of a card deck, numbering approximately 45,000 cards, and are on file in the Psychology Department, Washington University.

R 2

25,672

Barton, M.I., Goodglass, H. & Shai, A. DIFFERENTIAL RECOGNITION OF TACHISTOSCOPICALLY PRESENTED ENGLISH AND HEBREW WORDS IN RIGHT AND LEFT VISUAL FIELDS. Percept. mot. Skills, Oct. 1965, 21(2), 431-437. (US Veterans Administration Hospital, Boston, Mass.).

In this study, the role of lateral cerebral dominance in the consistent finding of lower tachistoscopic thresholds in the right than in the left visual field for alphabetic material was tested for readers of Hebrew and English. 20 Israeli Ss were presented with Hebrew and English 3-letter words, printed vertically, through a monocular tachistoscope, displaced to left or right of fixation by 2°21'. 10 American Ss were also tested for 3-letter English words, under similar conditions. Significantly lower thresholds in the right field were found for both groups and for both languages, despite the fact that Hebrew, unlike English, is read from right to left. These findings tend to support the hypothesis that alphabetic stimuli arriving in the major cerebral hemisphere are more readily recognized than similar stimuli arriving in the hemisphere contralateral to the language areas.

R 18

25,673

Brownfield, M.K. SEX AND STIMULUS TIME DIFFERENCES IN AFTERIMAGE DURATIONS. Percept. mot. Skills, Oct. 1965, 21(2), p446. (Bethany Nazarene College, Bethany, Okla.).

15 male and 15 female Ss were used in an experiment to investigate the relationship between the duration of perception of afterimages and sex. After 2 practice sessions each S was presented a 1-sq. cm. stimulus (at 0.2 candlepower) in random order for 3 different durations (1, 3, & 5 sec.). S turned off a timer when each afterimage disappeared completely, and durations were recorded in seconds. Males showed a slight positively skewed frequency curve of afterimage durations centering around 60 sec. Females showed a very definite positively skewed frequency curve centering around 30 sec. duration. A nonparametric median test yielded a significant chi square of 4.44 (p<.05). The possible relation of this finding to the age of the Ss (18 to 20 yrs.) was briefly considered. (HEIAS)

R 4

25,674

Newsome, L.R. JUDGMENT OF SIZE WITH VARYING CONDITIONS OF STIMULUS DURATION AND ILLUMINATION. Percept. mot. Skills, Oct. 1965, 21(2), 447-452. (University of Queensland, Queensland, Australia).

40 Ss assigned stimuli consisting of square grey patches of side lengths 1 in., 1 1/4 in., 1 3/4 in., & 2 in. into 5 categories according to perceived size. The stimuli were viewed tachistoscopically under 4 conditions of duration--625, 125, 25, & 5 msec.--and 2 conditions of illumination--1.00 & 0.80 log ft-L. on white. Half the Ss experienced high illumination conditions and the other half low. Pre-test training in the correct assignment of the stimulus set to the appropriate categories was given under conditions of free inspection. Data obtained from the 5-msec. treatment for both high and low illumination conditions were scaled by the graphical method of Diederich, Messick, & Tucker. The resulting scale values were interpreted as showing a constant shift in perceived size toward the smaller end of the size scale. The differences in slope and position of the graph of scale values against real size for the 2 illumination conditions suggest that the size shrinkage effect is a function of the interaction of illumination and duration.

R 7

25,675

Howarth, E. A TEST OF HULL'S REACTIVE INHIBITION CONCEPT: PERSISTENCE OF CURVILINEAR RESPONSE PATTERN IN BUTTON-PRESSING. Percept. mot. Skills, Oct. 1965, 21(2), 453-454. (University of Alberta, Edmonton, Alberta, Canada).

15 Ss were tested on a simple 5-button linear display in order to: a) verify a bowing effect observed in a previous study; and b) test whether the bowing was reduced in repeated trials. According to a prediction based on Hull's concept of reactive inhibition, the more frequent responses in the pattern should have become less frequent and the initial curve less bowed. This did not occur; in fact, an exactly opposite result was obtained.

25,676

Barrett, G.V. & Williamson, T.R. JUDGING WITH WHICH EYE ONE IS VIEWING A THREE-DIMENSIONAL SCENE. Percept. mot. Skills, Oct. 1965, 21(2), 455-458. (Goodyear Aerospace Corporation, Akron, Ohio).

15 Ss were asked to judge whether they were using either eye alone or both eyes while viewing a 3-dimensional scene. The judgments were made through an apparatus which occluded vision in either eye without Ss' awareness. It was found that while Ss could make the judgments above the chance level, they were in error on approximately 30% of the trials.

25,677

Guedry, F.E., Jr. HABITUATION TO COMPLEX VESTIBULAR STIMULATION IN MAN: TRANSFER AND RETENTION OF EFFECTS FROM TWELVE DAYS OF ROTATION AT 10 RPM. Percept. mot. Skills, Oct. 1965, 21(2), 459-481. (USN School of Aviation Medicine, Pensacola Air Station, Fla.). (c.f. Publication NSAM 921, March 1965).

9 men rotated at 10 rpm for 12 days. Control Ss were tested at comparable intervals. Tests conducted before and after the 12-day run demonstrated that nystagmus and subjective effects produced by head movements during the accustomed direction of rotation (CCW) had diminished markedly, whereas during CW rotation, 1 hr. after the 12-day run, nystagmus and subjective reactions approximately equaled reactions prior to the 12-day run. The unequal reduction was attributed to conditioned compensatory reactions. 2 days later, responses to both rotation directions were suppressed as compared with initial levels of response; compensatory reactions had apparently dissipated. Some response decline was still present after 3 wk. rest, but tests after 3 mo. revealed considerable recovery toward initial response levels. Reactions to passive whole-body angular acceleration were not greatly altered by the 12-day run.

R 31

25,678

King, D.J. & Walker, H.J. EFFECT OF PROMPTING ON THE IMMEDIATE RECALL OF MEANINGFUL MATERIAL PRACTICED UNDER DELAYED AUDITORY FEEDBACK. Percept. mot. Skills, Oct. 1965, 21(2), 483-488. (Albion College, Albion, Mich.).

80 Ss were divided into 4 groups. The 2 experimental groups read the stimulus story under conditions of DAF, and the 2 control groups were not so treated. 1 set of the control experimental groups was questioned regarding the content of the story immediately following the reading and before a recall was obtained (this was called the prompt procedure). The other groups recited the story immediately after reading it and were then prompted on those points not covered in their recall. There were significant differences between control and experimental groups on both indicants of accuracy of retention.

R 4

25,679

Goldstein, M. & Turpin, W.B. COMPLEX DISCRIMINATION WITH TWO STAGES OF SOLUTION. Percept. mot. Skills, Oct. 1965, 21(2), 491-496. (Princeton University, Princeton, N.J.).

A 4-display contingent identity discrimination design was combined with a 4-display contingent position discrimination design to produce a merged task whose 8 displays appeared repeatedly over a sequence of trials. Human Ss solved the contingent identity portion of the task first in nearly all cases and maintained a high level of accuracy on the solved portion while coping with the remainder. Experimental variations related to the visual distinctiveness of the 2 portions proved unimportant.

R 3

25,680

King, D.J. NOTE ON DELAYED AUDITORY FEEDBACK, EXPOSURE TIME AND RETENTION. Percept. mot. Skills, Oct. 1965, 21(2), 497-498. (Albion College, Albion Mich.).

2 groups of Ss, matched on reading rate, were exposed to the learning material for the same length of time. The experimental group practiced under conditions of delayed auditory feedback, the control group did not. The immediate retention of learned material was significantly poorer in the experimental group. The inhibition of immediate recall of connected meaningful material by delayed auditory feedback cannot be accounted for as a function of the decreased reading rate and resultant greater exposure duration to the learning material.

R 6

25,681

Applewhite, P.B., Paulhe, G.P. & Thompson, D.A. PREDICTION OF DRIVE STATE AND OUTPUT FROM FREQUENCY DISTRIBUTION SHAPE. Percept. mot. Skills, Oct. 1965, 21(2), 505-506. (Stanford University Medical School, Palo Alto, Calif.).

In a previous paper (Applewhite, et al., 1965) (HEIAS 25,573) we showed how the shape of frequency distributions changed as mean work output varied for a complex assembly task. Using this same task and 40 Ss, it is possible by using multiple regression statistics to predict the productivity and performance level on the task from the frequency distribution shapes. Ss were asked to perform the task at 4 different speed or performance levels: slow, comfortable, fast, as-fast-as-possible. As indicated previously, the mean productivity for all Ss was significantly different from level to level, increasing monotonically from the "slow" level. Productivity within these levels ranged from 49% to 130% of a "standard" industrial pace. Each of the 4 performance levels was assigned a different integer value (1 for "slow"...4 for "as-fast-as-possible") to quantify it for multiple regression analysis. The multiple Rs are significant ( $p < .01$ ). The most important predictors, for both productivity and performance level, are the SD and skewness; the modal frequency percentage and kurtosis add relatively little. As the standard errors of estimate indicate, productivity can be predicted with confidence .68 by the distribution shape to within 6.0 of the actual productivity; the performance level with confidence .68 to within .7 of the actual performance level on the scale of 1.0 to 4.0.

R 3

25,682

Eckenrode, R.T. TIME EFFICIENCY OF PREFERENCE SCALING METHODS. Percept. mot. Skills, Oct. 1965, 21(2), 507-514. (Dunlap & Associates, Inc., Darien, Conn.).

The time required by judges to complete the recording of their preferences among a series of items was measured in several situations. In an experiment concerning the judgment of the relative value of 6 weapon system criteria, time was measured on the recording of judgments by the following methods: ranking, rating, 3 versions of paired comparisons, and a method of successive comparisons. In a second experiment of judging 6 weapon system criteria, and a third on 6 manager characteristics, similar time data were collected by all methods but successive comparisons. In a fourth experiment, time data were collected on recording preferences for fruits, vegetables, colors, and vacation areas when 6, 10, 20, & 30 of each were ranked, and when paired comparisons was used for 6, 10, & 20 of each. Ranking consistently is by far the most efficient of the methods tested for recording such preferences, and, as previously reported research has shown, can yield preference scales similar to the other methods.

R 11

25,683

Ammons, Carol H. & Ammons, R.B. MOTOR SKILLS BIBLIOGRAPHY: XLV. PSYCHOLOGICAL ABSTRACTS, 1964, VOLUME 38 SECOND HALF. Percept. mot. Skills, Oct. 1965, 21(2), 515-518. (University of Montana, Bozeman, Mont.).

This is a 102 item bibliography on motor skills taken from the second half of Psychological Abstracts, 1964, Vol. 38. (HEIAS)

25,684

McGee, V.E. INVARIANCE OF PERSONAL CHARACTERISTICS OF VOICE OVER TWO VOWEL SOUNDS. Percept. mot. Skills, Oct. 1965, 21(2), 519-529. (Dartmouth College, Hanover, N.H.).

19 adult male voices were analyzed acoustically over 2 vowel sounds--/ee/ as in "heed" and /aw/ as in "hewed". It was found that the individual differences observed on the utterances of /ee/ were preserved very closely (invariant) on the utterances of /aw/. Frequencies between 1000 cps and 2300 cps appeared not to play any part in producing this invariance.

R 6

25,685

Halcomb, C.G. & Kirk, R.E. ORGANISMIC VARIABLES AS PREDICTORS OF VIGILANCE BEHAVIOR. Percept. mot. Skills, Oct. 1965, 21(2), 547-552. (Texas Technological College, Lubbock, Tex. & Baylor University, Waco, Tex.).

This research was designed to test the hypothesis that certain organismic variables are related to vigilance behavior. The vigilance task consisted of a cathode ray tube display which was monitored by 40 Ss for a period of 4 hr. Several of the organismic variables (personality and intelligence test data) were related to monitoring behavior. These were self-control and flexibility as measured by the California Psychological Inventory (CPI). Those Ss who scored high on both the intelligence test and the Achievement via Independence scale of the CPI showed no decline in their performance during the long monitoring session. These results suggest the feasibility of predicting S's performance on a vigilance task from psychological measures.

R 10

25,686

Rosenquist, H.S. THE VISUAL RESPONSE COMPONENT OF ROTARY PURSUIT TRACKING. Percept. mot. Skills, Oct. 1965, 21(2), 555-560. (University of Akron, Akron, Ohio).

Adams (1955) (HEIAS 8267) found that watching the rotary pursuit affected subsequent performance. Since this finding disagrees with reports by other investigators, the present experiment set out to test Adams' watching procedure for reliability and generality. Each of 198 Ss tracked the rotary pursuit for 5 min. with the right hand, next received 1 of 11 different treatments consisting of various durations of watching, resting, or both, and finally resumed tracking for another 5 min., using the left hand. After statistical adjustment of left-hand scores to the expected post-rest level, the results showed a decremental effect, supporting Adams, and indicated that the effect was functionally related to various durations of watching and resting.

R 10

25,687

Trumbo, D., Noble, M. & Ulrich, L. NUMBER OF ALTERNATIVES AND SEQUENCE LENGTH IN ACQUISITION OF A STEP-FUNCTION TRACKING TASK. Percept. mot. Skills, Oct. 1965, 21(2), 563-569. (Kansas State University, Manhattan, Kan.).

The roles of 2 task parameters, sequence length (N) and number of alternatives in the population from which the sequence was drawn (K), were examined in a tracking task. The tasks were irregular step-function inputs wherein N was defined as the number of targets (steps) in a repeating sequence and K was defined as the number of alternative target positions. N and K were varied independently in a 3x3 factorial design with 9 Ss per cell. The major findings were that tracking performance, as measured by integrated error scores, is affected by increases in N, but not proportionately, while neither K nor the N x K interaction was significant. Relations of the results to verbal learning data are discussed.

R 7

25,688

Jerison, H.J. HUMAN AND ANIMAL VIGILANCE. Percept. mot. Skills, Oct. 1965, 21(2), 580-582. (Behavior Research Lab., Antioch College, Yellow Springs, Ohio).

Experiments with both men and monkeys, summarized in this report, indicate that vigilance decrements are associated with the ease of difficulty of observing. A given set of signals may be detected often or rarely by human Os, depending on how easy it is to watch the background of stimulus events within which signals can occur.

R 3

25,689

Santos, J.F., Farrow, B.J. & Haines, J.R. CONSISTENCY AND STYLE OF AUTOKINETIC MOVEMENT. Percept. mot. Skills, Oct. 1965, 21(2), 583-586. (Menninger Foundation, Topeka, Kan.).

The records of Ss who were given a series of autokinetic (AK) trials in separate experimental sessions are discussed in terms of their inter-individual differences and intra-individual similarities. 18 Ss were given 5 AK trials. Each trial was given in a separate experimental session with the intertrial intervals ranging from several hours to 28 days. All Ss were dark adapted for 47 sec. prior to the 30 sec. presentation of the AK light. Ss were asked to trace what they saw on paper. Each group of 5 tracings was rated by 10 judges on the basis of their similarity. Direction of movement and length of line were the most important factors upon which judgments were based; however, consistency in the expansiveness or constrictiveness of successive tracings, the smoothness or abruptness in the direction changes and the number and location of direction changes were also indicated. A large number of Ss showed striking similarities in their successive experiences and there were sharp differences across Ss. (HEIAS)

R 1

25,690

Ammons, Carol H. & Ammons, R.B. PERCEPTION BIBLIOGRAPHY: XXI. PSYCHOLOGICAL INDEX, NO. 17, 1910. Percept. mot. Skills, Oct. 1965, 21(2), 587-590. (University of Montana, Bozeman, Mont.).

This is a 102 item bibliography on perception taken from the Psychological Index, No. 17, 1910. (HEIAS)

25,691

Guerrero-Figueroa, R. & Heath, R.G. ALTERATIONS OF INTERHIPPOCAMPAL IMPULSES IN MAN DURING NATURAL SLEEP AND DISTRACTION. Percept. mot. Skills, Oct. 1965, 21(2), 591-594. (Tulane University School of Medicine, New Orleans, La. & Southeast Louisiana Hospital, La.).

Interhippocampal evoked responses (IHR) were studied in 2 fully conscious men during wakefulness (w), natural sleep associated with slow wave electroencephalographic (EEG) activity (SS), sleep associated with rapid EEG activity (RS) and with rapid eye movements (REM) or both, and during distraction or attention. Striking incremental changes in amplitude of pre- and postsynaptic components of the IHR appeared during SS, whereas there was marked diminution in the amplitude of all components of the IHR during RS and REM, and while Ss solved a mathematics problem. It was suggested that hippocampal pre- and postsynaptic inhibition during attention and dreaming is dependent upon inhibitory influences from mesencephalic reticular formation.

R 5

25,692

Stern, J.A. & McDonald, D.G. PHYSIOLOGICAL CORRELATES OF MENTAL DISEASE. Annu. Rev. Psychol., 1965, 16, 225-264. (Washington University School of Medicine, St. Louis, Mo. & University of Missouri School of Medicine, Columbia, Mo.).

This is a review of current (1958-1964) research trends dealing with physiological correlates of psychiatric disturbances. Excluded is research with animals and studies dealing with physiological measures related to personality development and expressions of emotion. The authors estimate that 80% of the studies lack adequate controls. They also note the lack of testable theories to account for abnormal behavior. Most of the research reviewed deals with schizophrenia. A number of Russian studies are reviewed and are evaluated as being more rigorous than the American work. The review is broken down into the categories--verbal deficiency, personality disorders, schizophrenia, and affective disorders. It is concluded that the major shortcomings in research are: the poor controls, the lack of reliability of psychiatric diagnosis, and the crudity of the labels used by American psychiatry. It is suggested that labels should be attached not on the basis of clinical "impressions" but on the basis of constellations of symptoms. (HEIAS)

R 177

25,693

Friel, C.M. & Lhamon, W.T. GESTALT STUDY OF TIME ESTIMATION. Percept. mot. Skills, Oct. 1965, 21(2), 603-606. (US Franklin D. Roosevelt Veterans Administration Hospital & Cornell University School of Medicine, Ithaca, N.Y.).

In order to investigate the relationship between the temporal proximity of associational processes and the experience of time, 40 male Ss were asked to reproduce a series of 1-min. time intervals in which they wrote down words input to them at various rates. Half the group was given nonsense syllables and the other half was given words with high associational value. Ss who heard nonsense syllables gave progressively shorter estimates of the 1-min. interval as the rate of input of these stimuli was increased. However, Ss who heard words with high associational value showed no difference in their time estimates as the rate of input was increased. The study suggests that time estimates are in part a function of the frequency of associational processes initiated during a given temporal duration.

R 7

25,694

Roby, T.B. & Low, Lorraine. SOME TASK PARAMETERS IN SIMPLE PATTERN RECOGNITION. Percept. mot. Skills, Oct. 1965, 21(2), 607-617. (Tufts University, Medford, Mass. & School of Medicine, Boston University, Boston Mass.).

The task presented to individual Ss required identification of a particular set of 2 digit numbers that was wholly contained in a larger set of displayed elements. 5 stimulus factors were experimentally manipulated. Size of the display set, number of presumptive pattern sets, and density of display elements in the incorrect presumptive pattern sets were negatively related to accuracy of identification. The size of the pattern sets and the spatial distribution of pattern elements in the display were not related clearly to performance. The relevance of these studies to pattern identification in small group situations is discussed and illustrated.

R 4

25,695

Polidora, V.J. A RIGID, TRANSPARENT MANIPULANDUM FOR VISUAL DISPLAYS. Percept. mot. Skills, Oct. 1965, 21(2), 625-626. (University of Wisconsin, Madison, Wisc.).

This article is based on the finding that requiring S (especially monkeys) to touch a visual display in order to perform an instrumental response greatly increases the probability that S will orient to and sample the relevant components of the stimulus. The conventional method of instrumenting this response requirement is described and 2 disadvantages of this method are presented. The system described in the article overcomes these difficulties while retaining the advantageous properties of the conventional method. The system consists of 2 main parts, a contact relay circuit and commercially available glass coated with a thin (50 to 550 m) layer which is transparent, free of optical distortion, and electrically conductive (30 to 40 ohms per square area). A fairly detailed report of the construction of the system is given. (HEIAS)

R 6

25,696

Yensen, R. SOME IMPLICATIONS OF MUSCLE TENSION CHANGES DURING DESYNCHRONIZED SLEEP. Percept. mot. Skills, Oct. 1965, 21(2), 627-634. (Massey University of Manawatu, Palmerston North, New Zealand).

From a brief review of studies of muscle tension during sleep it is concluded that the widely accepted positive correlation between cerebral and psychological activity and muscle tension does not hold during desynchronized sleep (DS). Some similarities between DS and extreme relaxation are postulated, and a check of this hypothesis is suggested. Possible peripheral mechanisms involved in changes in muscle tension are discussed, and a technique of investigation is suggested whereby further insight into these mechanisms may be gained.

R 47

25,697

Lathrop, R.G. ERROR CORRELATIONS IN A TWO-DIMENSIONAL COMPENSATORY TRACKING TASK. Percept. mot. Skills, Oct. 1965, 21(2), 653-654. (Chico State College, Chico, Calif.).

Earlier studies utilizing 2-dimensional compensatory tracking have generally computed either a single dimension average error or have taken the simple sum of the 2 average errors each computed separately. Results of the current study indicate that average error computed on the more highly variant of the 2 dimensions accounts for approximately 85 to 90% of the variance of the simple sum average error. For most experiments, the reduction in the number of computer amplifiers required may justify the use of the single dimension average error.

R 1

25,698

Forgus, R.H. & Taylor, J. MEASUREMENT OF HEART RATE ACTIVITY IN TWO DIFFERENT RECORDING AND AMPLIFICATION SYSTEMS. Percept. mot. Skills, Oct. 1965, 21(2), 665-666. (US Veterans Administration Hospital, Downey, Ill. & Menninger Foundation, Topeka, Kan.).

The Stoelting Polygraph and Offner Dynograph systems for measuring heart rate are compared for the 2 systems vary markedly in cost, circuitry, transducing apparatus and portability. The double purpose of the study was: a) to assess the extent to which both systems covary over a moderate range of physiological activation; b) to determine if the method of pulse transduction significantly alters heart rate activity. 25 Ss were used. The pulse was transduced in the Offner unit by an electrode strapped onto the ventral surface of the upper forearm, in the Stoelting by a cuff inflated to 30 mm. and positioned around the ankle. Session 1 was concerned with the assessment of (b) above. Ss were run in a counterbalanced order on both measures. Basal heart rate activity was measured continuously for 10 min. To determine (a) above, Ss were required to run up and down 20 steps at a high pace set by E in Session 2. Following this, each was hooked up to both recording units and heart rate was activity monitored continuously for 15 min. Correlations between the 2 systems (all significant beyond the .01 level) suggest that under all levels of activity induced, both recording systems are identical. To determine if there were significant differences in heart rate between the electrode and cuff procedures, a 2x2 (electrode vs cuff; order 1 vs order 2) analysis of variance was performed. The differences were nonsignificant. (HEIAS)

25,699

Ammons, R.B. & Ammons, Carol H. PERCEPTION BIBLIOGRAPHY: XXII. PSYCHOLOGICAL INDEX, NO. 18, 1911. Percept. mot. Skills, Oct. 1965, 21(2), 667-670. (University of Montana, Bozeman, Mont.).

This is a 104 item bibliography on perception taken from the Psychological Index, No. 18, 1911. (HEIAS)

25,700

Schlesinger, I.M. DISCRIMINABILITY AS A FUNCTION OF FIGURE COMPLEXITY. J. gen. Psychol., July 1965, 73(First Half), 21-29. (Psychology Dept., Hebrew University, Jerusalem, Israel).

This experiment tested the prediction that, with long exposure times, errors decrease with redundancy of the stimulus figure; while with short exposure times, they increase. The 2 independent variables in this study were degree of complexity and exposure time. 36 Ss were used. 4 series of stimulus patterns consisting of 3, 5, 7, and 9 lights were used in a discrimination task. For all 3 exposure times employed (5 sec., 1 sec., and 150 msecs), response times, as well as number of errors, were found to increase significantly with figure complexity. These findings were taken to disconfirm Garner's explanation of the effect of stimulus redundancy. With practice, performance with the more complex patterns became more similar to that with simple ones. Various studies on the effect of stimulus redundancy on discrimination were reviewed, and an explanation of the seemingly contradictory findings was attempted.

R 14

25,701

Leon, H.V. & Arnhoff, F.N. COGNITIVE AND PERCEPTUAL DISTURBANCES IN SHORT-TERM SENSORY DEPRIVATION AS A FUNCTION OF DIFFERENTIAL EXPECTANCY LEVELS. J. gen. Psychol., July 1965, 73(First Half), 169-176. (School of Medicine, University of Miami, Coral Gables, Fla.).

In the present study, by controlling the amount of information about the effects of isolation, or Ss' expectations as to the probability that such effects would be experienced by him, it was predicted that the degree of disruption and discomfort would be a direct function of prior knowledge and expectancy. 3 comparable groups of Ss (12 in each), differing only in the amount of pre-experimental information they received, and in the differential behavioral expectancies developed as a result of this information, were confined for 2 hours in a McGill-type deprivation chamber. In Group I Ss were not permitted to see the experimental cubicle and were led into it blindfolded. They did not know the nature or duration of the study and were told to lie quietly. Group II was informed that this was a study in isolation and confinement and were told of the various types of perceptual and cognitive disturbances that sometimes occur in Ss undergoing such experimentation. It was suggested to Group III that they were expected to experience some of the phenomena they had been told about since this was the usual pattern of behavior. It was predicted that Group III would report the greatest amount of disturbance, Group I the second greatest, and Group II the least amount of disturbance. The results indicate significant differences in the predicted direction between the groups with respect to reported hallucinations, overall disturbance scores, and Ss estimation of time spent in isolation. (HEIAS)

R 20

25,702

Uno, T. & Grings, W.W. AUTONOMIC COMPONENTS OF ORIENTING BEHAVIOR. Psychophysiology, April 1965, 1(4), 311-321. (US Veterans Administration Hospital, Long Beach, Calif. & University of Southern California, Los Angeles, Calif.).

Changes in skin conductance (GSR), skin potential (SP), heart rate (HR), finger blood volume (BV), and pulse volume (PV) were recorded in response to 2-sec bursts of white noise. Five intensity levels of sound (60, 70, 80, 90, and 100 db) were presented over 5 repetitions. Results showed that: a) response magnitudes and latencies were directly related to stimulus intensity and inversely related to number of repetitions; b) for BV, SP, and GSR the effect of repetition varied with stimulus intensity; c) HR changes were primarily monophasic; and d) BV and PV were more sensitive to stimulus intensity differences than were the electrodermal responses.

R 18

25,703

Johnson, LaVerne C. & Landon, M.M. ECCRINE SWEAT GLAND ACTIVITY AND RACIAL DIFFERENCES IN RESTING SKIN CONDUCTANCE. *Psychophysiology*, April 1965, 1(4), 322-329. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif.).

Active eccrine sweat gland activity was measured in 30 Negro and 29 Caucasian male Ss to determine whether sweat gland activity was a possible factor in racial differences in skin conductance. Basal skin conductance, heart rate, respiratory rate, finger skin temperature and blood pressure were also obtained. Negro Ss had significantly lower skin conductance but no other significant physiological differences were found. While there was no significant difference in number of active sweat glands between the races, the intragroup relationship between sweat gland count and skin conductance was significantly higher for the Negro Ss. The two groups did not differ in number of nonspecific galvanic skin responses (GSRs) but the Caucasian Ss showed greater change in skin conductance to an initial tone stimulus. When differences in prestimulus levels were taken into account, the group differences in response to stimuli were no longer significant.

R 17

25,704

Hnatow, M. & Lang, P.J. LEARNED STABILIZATION OF CARDIAC RATE. *Psychophysiology*, April 1965, 1(4), 330-336. (University of Pittsburgh, Pittsburgh, Penn.).

Human Ss learned to reduce cardiac-rate variability when a visual display provided synchronous feedback of their own heart rate. S was simply instructed to keep his heart rate as steady as possible. He observed a visual display synchronized with his own cardiac rate. The only reinforcer was the immediate feedback of success or failure responses. The experiment was designed to assess the degree of heart-rate stability attained when Ss received meaningful information about their heart rate, compared with conditions in which no auxiliary information was provided. The increased stability was unaccompanied by significant changes in average heart rate, and was relatively unrelated to respiration changes. (HEIAS)

R 7

25,705

Darrow, C.W. & Hicks, R.G. INTERAREA ELECTROENCEPHALOGRAPHIC PHASE RELATIONSHIPS FOLLOWING SENSORY AND IDEATIONAL STIMULI. *Psychophysiology*, April 1965, 1(4), 337-346. (Psychophysiological Lab., Institute for Juvenile Research, Chicago, Ill.).

Recording of EEG time or phase relationships between brain areas is employed to determine if there are specific moment-by-moment differences in brain activity relating to differences in the organic response to what have been termed "simple sensory," "indifferent ideational," and "disturbing ideational" stimuli. Phase relationships between EEGs of different brain areas were automatically registered by previously described instrumentation. Simple sensory alerting or startling stimuli, also effective in producing galvanic response, are shown to be especially effective in increasing EEG leading in anterior and central brain areas; these are considered "accelerating" effects. Disturbing ideational stimuli consisting of emotionally toned words are found to increase rapid diphasic reversals of EEG phase relations between brain areas, in contrast with smaller or reduced diphasic effects following indifferent ideational verbal stimuli. The diphasic phase reversals are considered possible symptoms of interaction between brain areas. With regularly repeated sensory stimuli, diphasic phase reversals may shift from a position of response to one of anticipation of the stimulus. Whereas anterior and central EEG-accelerating effects follow stimuli which have arousing or accelerating effects on the activity of the organism, diphasic reversals of phase relation between brain areas are found related to attentive and perceptual-ideational reaction processes.

R 13

25,706

Baumeister, A., Smith, T.E. & Urquhart, D. EFFECTS OF ROTATION SPEED, EXPOSURE TIME, AND DISTANCE ON THE SPIRAL AFTEREFFECT. *J. gen. Psychol.*, Jan. 1965, 72(First Half), 151-156. (Psychology Dept., Central Michigan University, Mt. Pleasant, Mich.).

The purpose of this study was to investigate concomitantly the effects of certain parameters upon duration of the spiral aftereffects in normal Ss. The variables studied were speed of rotation, exposure time, distance, and trials. 80 college students were randomly assigned to 8 experimental conditions composed of 2 levels of exposure (30 sec. and 15 sec.), 2 levels of distance (8 ft. and 16 ft.), and 2 levels of speed (45 rpm and 78 rpm). The stimulus was a 7-inch, 920° Archimedes Spiral rotated clockwise on a record-player turntable. The test object was a 4-inch white circle. Ss were given 5 trials, the last 4 of which provided the criterion data. Presentation of the test object was accomplished by raising a door over the spiral apparatus. This started a timer which E stopped when S reported that he no longer experienced the illusion. ANOVA indicated that the duration of the aftereffect was not significantly influenced by variations in speed, exposure, or distance. The only significant main effect was trials, Ss experiencing the aftereffect less on succeeding trials. Reliabilities of the criterion measure ranged between .68 and .91.

R 11

25,707

Spigel, I.M. LIFT REACTION TIME AND TOPOGRAPHIC COMPATIBILITY OF THE S-R FIELD. *J. gen. Psychol.*, Jan. 1965, 72(First Half), 165-172. (Psychology Dept., Temple University, Philadelphia, Penn.).

The current investigation was designed to explore the relationship of lift reaction time to topographic compatibility of the S-R field both within and across 2-, 3-, and 4-choice situations. 88 Ss were employed in 2 experiments which required a response to a position corresponding to stimulus locations of light-on, light-off, a position of no change, and to a position of clockwise reorientation. A consistent trend emerged within each of the choice situations, though analogous differences within the latter were not all statistically significant. R.T. to light-on was fastest, with response to light-off next. Latencies to the position of no change and to a clockwise advance were longest. The results supported the general determination that R.T. is independent of stimulus information in the case of highly compatible S-R fields. No clear linear increments emerged with the increased number of response probabilities in the case of light-on and light-off signals. Other obtained differences represented further departures from strictly linear relationships.

R 7



25,708

Tune, G.S. THE NONINDEPENDENCE OF RESPONSES TO A TWO-CHOICE SITUATION. J. gen. Psychol., Jan. 1965, 72(First Half), 173-178. (Psychology Dept., University of Liverpool, MRC, Liverpool, England).

In the last decade the assumption made by the classical psychophysical method of limits that responses given at the thresholds are statistically independent of each other, has been called into doubt. Studies on the response mechanisms evident at the visual threshold have shown that responses are not independent and are highly correlated with each other. Although it seems unlikely that human Ss can generate a random series, it remains to be seen whether they can reproduce such a series, and under what degree of subjective uncertainty Ss fail to reproduce a random series of events. In the present experiment 5 Ss were required to report or, if they could not see clearly, guess in which of 2 positions (either directly up--position A, or directly down--position B) the gap of the Landolt C was in. The Ss did their task from each of 5 positions, nearer to or further away from the Landolt C, in random order. The results show that when Ss are forced to base their decisions on inadequate evidence, they tend to respond in a nonrandom manner. At the point where they are making only a chance score, it appears that their decisions are based on what they have previously done. There is an area between 50% and 60% correct response which seems to be peculiarly sensitive in that previous responses come to play a more important part in determining what the next response will be. Outside of this sensitive area, although the stimulus does influence the response, there is large and growing random influence. (HEIAS)

R 8

25,709

Mefferd, R.B., Jr. & Wieland, Betty A. MODIFICATION IN AUTONOMICALLY MEDICATED PHYSIOLOGICAL RESPONSES TO COLD PRESSOR BY WORD ASSOCIATION. Psychophysiology, July 1965, 2(1), 1-9. (US Veterans Administration Hospital, Houston, Tex.).

Physiological measures--basal skin resistance (BSR), galvanic skin resistance (GSR), electrocardiogram (ECG), and skin temperatures--were made on 120 consecutive days on 3 male Ss during rest, a 20-item word association test, recovery, a cold-pressor test, a combination of cold-pressor and a second similar word-association test, and final recovery. Each stimulus alone induced increased sympathetic activity. Ongoing stress (cold pressor) responses, however, were depressed during the word-association test. Furthermore, the nature, reaction times, and commonalities of the associations were influenced by the stress. The inhibition was not due to order, threshold, adaptation, or conditioning effects.

R 19

25,710

Burstein, K.R., Fenz, W.D., Bergeron, J. & Epstein, S. A COMPARISON OF SKIN POTENTIAL AND SKIN RESISTANCE RESPONSES AS MEASURES OF EMOTIONAL RESPONSIVITY. Psychophysiology, July 1965, 2(1), 14-24. (University of Massachusetts, Amherst, Mass.).

The purpose of this study was to compare gradients of skin resistance (SR) and skin potential (SP) responses generated by differing degrees of psychologically disturbing stimuli, and to determine the significance of the different wave forms of skin potential. SR and SP were simultaneously recorded during a word-association test that included 3 levels of psychologically disturbing verbal stimuli. In addition to the a and b waves of the SP response, a second negative wave form, a<sub>2</sub> was recorded. SR and all SP wave forms yielded positive gradients as a function of increasing stimulus intensity. Gradients based upon SR and total SP were close to identical. Magnitude measures, which include zero responses, of the SP wave forms yielded steeper gradients than measures of amplitude or frequency. The relative contribution of different SP wave forms to total SP varied with stimulus level.

R 12

25,711

Wilcott, R.C. & Hammond, L.J. ON THE CONSTANT-CURRENT ERROR IN SKIN RESISTANCE MEASUREMENT. Psychophysiology, July 1965, 2(1), 39-41. (Psychology Dept., Western Reserve University, Cleveland, Ohio, & Psychology Dept., University of Pennsylvania, Philadelphia, Penn.).

A substantial reduction in skin resistance (SR) is produced by a rise in induced voltage. This indicates that with a constant-current circuit, variations in voltage can have a significant effect on the SR level. Therefore, SR levels obtained with a constant-current and constant-voltage circuits were compared for a group of Ss. The higher the SR level, the greater the discrepancy between the constant-current and constant-voltage measurements. The use of a constant-voltage circuit when measuring high SR levels is recommended.

R 2

25,712

Opton, E., Jr., Rankin, N.O. & Lazarus, R.S. A SIMPLIFIED METHOD OF HEART RATE MEASUREMENT. Psychophysiology, Oct. 1965, 2(2), 87-97. (Psychology Dept., University of California, Berkeley, Calif.).

Theoretical and practical considerations require a heart rate measurement method which produces substantial correspondence between heart rate and other autonomic and psychological measures of arousal, and which also is fast and inexpensive. A new heart rate measurement method, the peak rate method, meets these criteria. The peak rate method corresponds as closely to a skin conductance measure of reaction to a stressful movie as does the method of mean cyclic maxima (Malmstrom, Opton, & Lazarus, in press). The peak rate method also yields heart rate curves which are markedly elevated at the most psychologically stressful points during the movie. The peak rate method does not involve the laborious, expensive computations required by the method of mean cyclic maxima. Smoothing heart rate curves by a method of moving averages is also shown to be desirable.

R 21

25,713

Zimny, G.H. & Schwabe, L.W. STIMULUS CHANGE AND HABITUATION OF THE ORIENTING RESPONSE. Psychophysiology, Oct. 1965, 2(2), 103-115. (Psychiatry Dept., St. Louis University School of Medicine, St. Louis, Mo.).

8 hypotheses derived from Sokolov's theory of habituation of the orienting response were tested. Ss were given a series of 36 standard stimuli (SSs), each 500 cps. 4 interpolations of a 1000-cps test stimulus (TS) for one group (N=10) and of a 4000-cps TS for another group (N=10) were made. Results for amplitude of galvanic skin response (GSR) for combined groups showed that habituation occurred over the first 8 SSs and over the 4 TSs, that a TS produced return of GSR and disrupted habituation to the SS, and that response was greater to the TS than to the following SS. The 4000 TS disrupted habituation to the SS more than the 1000 TS and produced less drop from the TS to the next SS. 7 hypotheses were confirmed. Habituation of resistance level was found but spontaneous fluctuations were not. Sokolov's theory and the results obtained were related to the classical conditioning of autonomic response.

R 22

25,714

Simons, D.G. & Perez, R.E. THE B/GSR MODULE: A COMBINED RECORDING TO PRESENT BASE SKIN RESISTANCE AND GALVANIC SKIN REFLEX ACTIVITY PATTERNS. Psychophysiology, Oct. 1965, 2(2), 116-124. (USAF School of Aerospace Medicine, Brooks AFB, Tex. & Technology Incorporated, Dayton, Ohio).

A base skin resistance galvanic skin reflex (B/GSR) module combined BSR and GSR activity into a 1-channel recording. 3 identical modules were used to record 3 sites simultaneously on a series of normal subjects. Electrode sites included bilateral palmar locations and a location just beneath the medial malleolus. The GSR amplification factor was a fixed value of 3.0. The units provided a generally satisfactory combined record of BSR and reflex activity. The BSR and GSR patterns observed simultaneously from 3 sites consistently showed very similar changes. Four distinct B/GSR activity patterns were identified.

R 8

25,715

Berger, R.J. & Meier, G.W. AN AUTOMATIC ANALYZER OF STATES OF VIGILANCE. Psychophysiology, Oct. 1965, 2(2), 141-145. (Perinatal Physiology Lab., National Institute of Neurological Diseases & Blindness, National Institute of Health, San Juan, Puerto Rico).

An assemblage of relay-operated, commercially available programming modules is described. It is capable of discriminating among the states of vigilance--wakefulness (W); high-voltage, slow-wave sleep (HVS); and low-voltage, fast-wave sleep (LVF)--and it requires information from only the nuchal electromyogram (EMG) and the electrooculogram (EOG).

R 6

25,716

Daniel, R.S. ELECTROENCEPHALOGRAPHIC PATTERN QUANTIFICATION AND THE AROUSAL CONTINUUM. Psychophysiology, Oct. 1965, 2(2), 146-160. (Psychology Dept., University of Missouri, Columbia, Mo.).

The view that the EEG shows a continuum correlated with behavioral arousal was subjected to experimental test. A simple model of the expected results from 5 experimental states of arousal was used as a criterion against which to evaluate various parameters of EEG data after they had been processed by electronic analysis systems. 18 normal young adults were the Ss. Occipital and parietal recordings were taken during relaxation, attention, arousal, recovery, and relief states. Sample epochs of the records were analyzed by amplitude distribution, frequency spectrum, power spectrum, wavelength distribution, autocorrelation, and cross correlation. No single parameter matched the predicted model in a convincing manner. However, correlograms of occipital recordings after interpretation by relative power ratios did support the hypothesis with statistically significant differences. It was concluded that behavioral arousal is inversely related to the scaled continua of: a) the proportion of total power to be found at the dominant frequency; and b) rhythmicity of the dominant wave.

R 30

25,717

Skov, E.R. & Simons, D.G. EEG ELECTRODES FOR IN-FLIGHT MONITORING. Task 775506, SAM TR 65 18, April 1965, 6pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Psychophysiology, Oct. 1965, 2(2), 161-167).

An electrode is described for in-flight recording of EEG. The electrode provides significant improvement over previously available types. When properly applied, it produces little noise, even when tapped. It is resistant to accidental dislodgement and is comfortable under close-fitting headgear. The leads, a major problem source, may easily be replaced. The impedance between 2 electrodes is 5000 ohms or less, permitting use with miniature transistorized amplifiers.

R 9

25,718

Oldfield, R.C. & Wingfield, A. RESPONSE LATENCIES IN NAMING OBJECTS. Quart. J. exp. Psychol., Nov. 1965, XVII (Part 4), 273-281. (Institute of Experimental Psychology, MRC, University of Oxford, Oxford, England).

After some preliminary analysis of what is involved in naming objects, in which the possible role of classificatory systems in the memory store is discussed, it is shown experimentally that there are consistent differences between the times taken to respond to presented objects by uttering their names, variations between the performances of different individuals being outweighed by variations due to the different objects. Moreover, there is a high consistency between different individuals as to the ordering of objects in respect of their naming latencies. It is further shown that a high correlation exists between the time taken to name an object and the frequency with which its name occurs in the language as a whole, as estimated in the Thorndike-Lorge Word List. Some implications of these findings are discussed, especially with reference to possible mechanisms by which presented objects are visually identified, and the appropriate names retrieved from the "word-store".

R 12

25,719

Florentini, Adriana & Mackay, D.M. TEMPORAL FACTORS IN PATTERN VISION. Quart. J. exp. Psychol., Nov. 1965, XVII (Part 4), 282-291. (Optics Institute, Florence, Italy & Communication Dept., University of Keele, Staffordshire, England).

A sequence of uncorrelated randomly patterned visual stimuli ("visual noise") is normally seen as a field of particles in "Brownian motion." When each frame of the sequence is followed by a blank flash superimposed on the same region of the visual field, the apparent structure of the noise field is strikingly altered, its form varying with the time interval between frame and flash. At a critical interval, many dots seem to cohere, to form maggot-like objects. The 2 authors acted as Ss or Os in this experiment. Some of the factors determining this critical interval have been studied. They include the brightness, repetition frequency and exposure duration of the noise field, and the distance of its retinal image from the fovea. The critical interval for "perceptual blanking" is quite different from that for the "maggot effect", but the 2 show a suggestively similar dependence upon the duty cycle of the noise display. It is of some neurological interest that the phenomenon is not appreciable visible with dichoptic mixing of noise and blank stimuli.

R 8

25,720

Talland, G.A. THREE ESTIMATES OF THE WORD SPAN AND THEIR STABILITY OVER THE ADULT YEARS. Quart. J. exp. Psychol., Nov. 1965, XVII(Part 4), 301-307. (Stanley Cobb Labs., Massachusetts General Hospital, Boston, Mass.).

3 estimates of the immediate word span were compared in groups of men representing each decade between the ages of 20 & 69 yrs. 6 Ss represented each age group. No systematic change with age was found in free recall or in partial recall requiring the reproduction of the unrecalled word in lists of 4 to 7 items. When the instruction was to report the entire list but leave the unrecalled word last, performance steadily deteriorated with age. Mean success in recall decreased on 3 criteria, and error by false terminal placement increased from each decade to the next. The results support the hypothesis that capacity to perform simultaneously 2 such operations as sub-vocal rehearsal of 1 item and vocal enumeration of the other items shrinks with the advancing years. This interpretation of the findings agrees with other observations about age-related changes in perceptual-motor skills and cognitive capacity, and indicates the manner in which an increased propensity to forgetfulness with the advancing years originates in immediate memory. It is also noted that in the general population the immediate word span is well below that determined in college students, even under the least exacting conditions of free recall, and that the additional requirement to search for, select and test a required item does not further restrict the work span below the age of 50.

R 13

25,721

Kahneman, D. EXPOSURE DURATION AND EFFECTIVE FIGURE-GROUND CONTRAST. Quart. J. exp. Psychol., Nov. 1965, XVII(Part 4), 308-314. (Hebrew University, Jerusalem, Israel).

The pre- and post-exposure fields in the tachistoscopic presentation are assumed to reduce the apparent contrast of the figure by brightness summation. A matching procedure was used to measure this effect. Measurements were obtained for 4 levels of background luminance, ranging from 40 ml. to 0.0013 ml. in steps of 1.5 log units. 2 experienced Ss participated in the experiment. For each of them, 2 series of measurements were obtained at each luminance level, for values of physical contrast in the standard exposure ranging from 10 to 80%. For 10, a single session consisted of 2 series of measurements at the same luminance level. For the other, 2 different levels of background luminance were investigated in each session. Apparent contrast rises linearly with duration, but only in the upper range. Further observations confirm the suggestion that the pre- and post-exposure fields retard the formation of bounding contours with a further reduction of apparent contrast at short durations as a result. It is indicated that the contrast-matching method provides a short-cut technique for the measurement of the temporal range of brightness summation.

R 13

25,722

Jensen, A.R. AN ADJACENCY EFFECT IN FREE RECALL. Quart. J. exp. Psychol., Nov. 1965, XVII(Part 4), 315-322. (Human Learning Institute, University of California, Berkeley, Calif.).

An adjacency effect was demonstrated at a high level of significance in the free recall, by 123 Ss, of a list of 40 high-frequency nouns presented in varying order on successive trials. The phenomenon referred to as the adjacency effect consists of the fact that when a S is given repeated trials of study and free recall of a list of words (always presented in a different order), the probability of recalling a given item is greater when the item is presented temporally adjacent to an item which is already learned (as evidenced by recall on the previous trial) than when the item stands temporally between other items which are not yet learned. The enhancement of recall is greater when the item is presented between 2 previously learned items. The implications of the adjacency effect for verbal learning theory, particularly for the serial-position effect in serial learning and the concepts of interference and neural consolidation, are discussed.

R 6

25,723

Ross, Helen E. THE SIZE-CONSTANCY OF UNDERWATER SWIMMERS. Quart. J. exp. Psychol., Nov. 1965, XVII(Part 4), 329-337. (Psychological Lab., University of Cambridge, Cambridge, England).

The size-constancy of 15 divers was measured by requiring them to adjust the distance between 2 disks of unequal size so that they appeared phenomenally equal. In clear water divers showed greater constancy-ratios than on land. In murky water, where visibility was reduced by suspended particles, constancy-ratios were the same as, or less than, on land. It is suggested that these effects may be due to changes in apparent distance: in clear water objects appear nearer through refraction, but in murky water they appear further away because of the distance cues provided by the visibility gradient. The orientation of the display, or of the diver's body, did not affect constancy under water, though it does on land. It is argued that the effect on land is due to visual and proprioceptive cues which are absent in the water.

R 16

25,724

Howe, M.J.A. INTRA-LIST DIFFERENCES IN SHORT-TERM MEMORY. Quart. J. exp. Psychol., Nov. 1965, XVII(Part 4), 338-342. (Psychology Dept., University of Sheffield, Sheffield, England)

12 Ss attempted to recall lists of 9 consonants immediately after presentation. There were 6 conditions representing the possible orders of recall of the 3 groups of 3 letters making each list. Thus, if order of presentation can be represented as 1, 2, 3 the numbers standing for the first, second, and third parts of 3 letters, recall order could be any of the 6 combinations of the numbers, 1, 2, & 3. Using various recall orders it was found that recall of part of a list interfered with retention of the other parts, memory for items presented early in a list being less affected by such interference than was that for later items. Since this result was not obtained when rate of presentation was increased, it is suggested that rehearsal contributed to the greater stability of early items.

R 10

25,725

Henderson, A., Goldman-Eisler, Frieda & Skarbek, A. THE COMMON VALUE OF PAUSING TIME IN SPONTANEOUS SPEECH. Quart. J. exp. Psychol., Nov. 1965, XVII(Part 4), 343-345. (Psycholinguistic Research Unit, University College, London, England).

Experiments have shown that hesitation increases both before and during speech concerned with the solution of verbal tasks which involve an increasing degree of syntactic or semantic complexity. These experiments have been concerned with differences between tasks. An attempt is made to compare hesitation time between individuals who are set the same tasks, in terms of the quality of their responses to the tasks. Individual dispositions to a characteristic speech-silence ratio complicate such comparisons. A previous experiment is briefly reported in which 10 Ss were shown a series of 6 caption-less cartoons and were instructed to describe the cartoon picture by picture in addition to formulating the general point or moral in as concise a form as possible. Mean pause per word measures were taken separately for the descriptions and for the generalizations for each individual's cartoons. The quality of the generalizations were rated by 3 judges. Here a strong trend was found between the quality of the Ss' responses and the extra time they took over and above their characteristic speech-silence ratios.

R 9

25,726

Power, R.P. THE EFFECT OF INSTRUCTIONS ON THE APPARENT REVERSAL OF ROTARY MOTION IN DEPTH. Quart. J. exp. Psychol., Nov. 1965, XVII(Part 4), 346-350. (Psychology Dept., University of Sydney, Sydney, Australia).

This study concerns experimental investigation of the effect of instructions on the apparent reversal of rotary motion in depth. 60 Ss were used; 30 in Exp. I and 30 in Exp. II. Each S was given 4 trials, each of 20 revolutions, with a rest period of 64 sec. between trials. All observations were monocular, the S using his preferred eye. It was found that Ss instructed to report apparent reversals of an elliptical shape signalled more reversals than Ss who were instructed to report the non-occurrence of reversals. This difference increased over 4 trials. When the stimulus object was a trapezium window instructions to report reversals led to a higher rate of reversals than did instructions to report non-occurrence, but this difference did not increase significantly over trials.

R 9

25,727

Chase, R.A., Cullen, J.K., Jr., Openshaw, J.W. & Sullivan, S.A. STUDIES ON SENSORY FEEDBACK: III. THE EFFECTS OF DISPLAY GAIN ON TRACKING PERFORMANCE. Quart. J. exp. Psychol., Aug. 1965, XVII(Part 3), 193-208. (Neurocommunications Lab., Johns Hopkins University School of Medicine, Baltimore, Md.).

Instrumentation is described which permits study of the effects of different forms of visual feedback display on the patterns of fine movement obtained from the extended human index finger when the S is attempting to keep his finger at a fixed point in space. The task is a compensatory tracking task in which the only source of input to the system is the S's own finger movement. The effects of increasing the gain (or amplification) of a proportional error signal on the pattern of finger movement was studied. Gains of 1, 2, 4, 10, 20, & 40 were studied with a group of 24 Ss. Increasing the gain of a proportional error signal resulted in a marked improvement in the ability of Ss to maintain their extended finger at a fixed point in space. As the gain of the error signal was increased, the S's high-amplitude, low frequency errors were reduced, and there was a progressive appearance of high-frequency activity of low-amplitude, more accurately centred about the reference position in space. A total off-target area measure (integrated absolute error) showed marked decrease in scores as the amplification of the error signal was increased from 1 through 10. Beyond this gain there was no appreciable additional improvement in motor control, however, no degradation of control was noted to characterize the group performance. Exploratory studies were undertaken to permit comparison of the effects of increasing the gain of proportional visual display with the effects of increasing the gain of non-proportional visual and auditory displays. An increase in the dominant-energy frequency was noted as the error signal gain was increased, independent of whether a proportional visual, or non-proportional visual or auditory display was used. This observation suggests that common mechanisms mediate the processing of the gain parameters of feedback displays, in some measure independent of the display form or the sensory modality used for presentation. R 55

25,728

Joyson, R.B., Newson, L.J. & May, D.S. THE LIMITS OF OVER-CONSTANCY. Quart. J. exp. Psychol., Aug. 1965, XVII(Part 3), 209-216. (Psychology Dept., University of Nottingham, Nottingham, England).

A number of studies have led to the generalization that there is a tendency to "over constancy" in the perception of size. To determine some of the factors which contribute to these results, 4 experiments were conducted. In Exp. I 10 Ss made absolute size judgments of 5 rectangular planks with lengths of 12, 24, 48, 84, & 132 in. and widths of 3, 3, 4, 5, & 9 in. respectively. The experiment was conducted on an airfield which offered a level stretch about 600 yd. long. Beyond this distance the ground dropped so that the S was presented with an empty horizon. No objects were visible within 30° on either side of the target. Exp. II was conducted on a level stretch of 300 yd. bounded on all sides by large trees. The standard objects were similar to those in Exp. I with slightly different lengths and widths. Each was presented singly at 3 distances, making 12 conditions in all. 6 Ss were run under each condition (i.e., 72 Ss in all). Each S made 4 judgments. The environment and procedure of Exp. III were identical to that of Exp. II except that 4 sizes of circles were presented to 48 Ss. Exp. IV was conducted indoors, in a room 30 ft by 20 ft. 200 Ss were required to make different judgments about cardboard circles presented against a black background. No universal tendency to over-estimate size was found. The results clearly suggest that over-estimation is limited to objects subtending angles of approximately 2° or less, and that objects subtending greater angles are judged fairly accurately. This raises the possibility that foveal diameter (approximately 2°) is involved. (HEIAS)

R 15

25,729

Whittle, P. BINOCULAR RIVALRY AND THE CONTRAST AT CONTOURS. *Quart. J. exp. Psychol.*, Aug. 1965, *XVII*(Part 3), 217-226. (Psychological Lab., University of Cambridge, Cambridge, England).

3 experiments are reported: a) The Rivalry of Intersecting Contours; b) The Rivalry of Light and Dark Circles; and c) The Rivalry of Bright and Dark Circles. Binocular rivalry was recorded between various achromatic figures in or near the foveae. For a pair of intersecting contours, 1 in the field of each eye, it was found that the percentage of time for which a contour was dominant at the point of intersection increased with the contrast at that contour, and also with average luminance when contrast was constant. Further, for 1° circles in corresponding positions in the 2 fields, 1 darker than its surround and 1 lighter, the same results were obtained. Various auxiliary results, on rate of rivalry, eye-dominance, the occasional mixture of the rivaling stimuli, and binocular lustre, are given. Finally the relationship between predominance in rivalry and perceived brightness is discussed.

R 11

25,730

Craik, F.I.M. THE NATURE OF THE AGE DECREMENT IN PERFORMANCE ON DICHOTIC LISTENING TASKS. *Quart. J. exp. Psychol.*, Aug. 1965, *XVII*(Part 3), 227-240. (Occupational Aspects of Ageing Research Unit, MRC, University of Liverpool, Liverpool, England).

Previous experimental work has shown that when Ss of different ages are presented with a series of dichotic digits (as 2 simultaneous half-sets, 1 to each ear) there is an age decrement in the reproduction of the second half-set. It has been suggested that this result is due to the second half-set being involved in a short-term storage process and that this process declines in efficiency with age. It seemed equally possible, however, that the result was due to perceptual or attentional factors rather than memory factors. 2 experiments were thus carried out in an attempt to specify the nature of the decrement. In the first (48 Ss), instructions as to which half-set to reproduce first were given before presentation of the digits. In the second experiment (40 Ss) attention was equally divided between the ears by giving these instructions after presentation. An analysis of types of error in the first experiment suggested that attentional factors were more important but from a similar analysis in the second experiment it was concluded that memory factors were largely responsible for the age decrement.

R 10

25,731

Wickelgren, W.A. SIMILARITY AND INTRUSIONS IN SHORT-TERM MEMORY FOR CONSONANT-VOWEL DIGRAMS. *Quart. J. exp. Psychol.*, Aug. 1965, *XVII*(Part 3), 241-246. (Massachusetts Institute of Technology, Cambridge, Mass.).

13 Ss listened to lists of 6 consonant-vowel digrams presented at the rate of 0.8 sec./digram and copied them as they were being presented. Immediately after finishing copying the list, they attempted ordered recall of the 6 digrams. The digrams in each list were chosen from a population of 8 digrams consisting of all digrams that can be constructed from the consonants 'f' and 'n', the vowels 'a' and 'o', and the 2 orders 'CV' and 'VC'. Intrusions tended to be similar to the presented digram, and the frequency of an intrusion was a monotonic increasing function of degree of similarity to the presented digram. The ordering of intrusion frequency for each similarity type was from greatest to least: ++ (same consonant, different vowel, same order), +- , -+ , -+ , +- , ---. The findings indicate that forgetting is not all-or-none, that digrams are coded in terms of phonemes, and that initial vs. terminal position is a distinctive feature of consonants, but not vowels, in short-term memory.

R 3

25,732

Hammerton, M. A NOTE ON THE APPLICATION OF INFORMATION THEORY TO STUDIES OF TRACKING BEHAVIOR. *Quart. J. exp. Psychol.*, Aug. 1965, *XVII*(Part 3), 261-266. (Applied Psychology Research Unit, MRC, Cambridge, England).

This brief paper responds to the information theory approach to tracking suggested by Crossman. The discussion centers around Crossman's statement concerning the 3 conditions which he believes must be fulfilled if information theory is to be applied validly to a tracking experiment. These conditions are: a) 'The course and the S's performance must be statistically 'stationary' during a trial...'; b) 'The successive samples of the course must be, or appear to the S to be, uncorrelated, so that the calculated input entropy shall fairly represent what he experiences'; c) 'The Bandwidths of the course and track must be known and similar, so that the proper sampling interval for both can be calculated...'. The writer presents his contention that both conditions b and c are not invariably necessary. He also includes a reservation about the instructions which Crossman gave to his Ss. (HEIAS)

R 10

25,733

Grindley, G.C. & Townsend, Valerie. BINOCULAR MASKING INDUCED BY A MOVING OBJECT. *Quart. J. exp. Psychol.*, May 1965, *XVII*(Part 2), 97-109. (Psychological Lab., Cambridge University, Cambridge, England).

Movement in a part of either of 2 binocular fields can, under some conditions, produce temporary obliteration of the corresponding part of the other field. This paper is a mainly qualitative study of this rather surprising phenomenon. 50 Ss were used and the following 6 experiments are described: a) Qualitative description of the phenomenon with very simple displays; b) Velocity of the moving object; c) Peripheral viewing; d) On-off effect; e) Direction of movement and viewing; f) Reversal of figure and ground. The effect is found to increase from the fovea to the periphery, to be greatest at a velocity of about 20° visual angle per sec. and to vary with the orientation of the fixation point in the visual field. Some further lines of research designed to elucidate the relation of the effect described here to certain other visual phenomena are suggested.

R 14

25,734

Yates, A.J. DELAYED AUDITORY FEEDBACK AND SHADOWING. *Quart. J. exp. Psychol.*, May 1965, *XVII*(Part 2), 125-131. (University of Western Australia, Perth, Australia).

On the basis of speech disturbance under binaural delayed auditory feedback, 2 groups of 12 Ss of high and low susceptibility were formed. Both groups were required to shadow messages presented under 4 conditions: single message presented binaurally; message presented to 1 ear with either white noise, an irrelevant message, or delayed feedback of the repetition of the message, presented to the contralateral ear. For both groups the number of errors (omitted words) increased significantly in the irrelevant message and the delayed feedback conditions as compared with the binaural or white noise conditions. There was no difference between the susceptible and non-susceptible groups in the binaural and white noise conditions, but the susceptible group showed a much larger increase in the irrelevant message and delayed feedback conditions. Implications of these findings for theories of DAF are discussed.

R 10

25,735

Postman, L. & Phillips, Laura W. SHORT-TERM TEMPORAL CHANGES IN FREE RECALL. *Quart. J. exp. Psychol.*, May 1965, *XVII*(Part 2), 132-138. (University of California, Berkeley, Calif.).

An experimental study of short-term memory for lists of familiar English words is reported. Lists of 10, 20, & 30 unrelated words were presented at a 1 sec. rate to 3 groups of 18 Ss, 1 for each length of list. Retention was measured by free recall after intervals of 0, 15 & 30 sec. A counting task was used to prevent rehearsal during the retention interval. The absolute level of recall increased with length of list whereas the percentages retained showed the reverse trend. The recall scores decreased steadily as a function of retention interval, with the rates of forgetting comparable for the 3 lengths of list. The decline in the amount recalled was due in large measure to the loss of the terminal items in the list. Consequently, the pronounced recency effect present on the immediate test of recall was progressively reduced as a function of time. By contrast retention of the initial part of the list was relatively stable. These variations in rate of forgetting are attributed to differences among serial positions in susceptibility to proactive inhibition.

R 14

25,736

Pollack, I. ITERATIVE TECHNIQUES FOR UNBIASED RATING SCALES. *Quart. J. exp. Psychol.*, May 1965, *XVII*(Part 2), 139-148. (Mental Health Research Institute, University of Michigan, Ann Arbor, Mich.).

1 source of stimulus bias on the part of the E often arises from the arbitrarily selected stimulus values at the beginning of the experiment. 3 iterative techniques for neutralizing the effects of stimulus bias in category rating experiments were examined with a wide variety of stimulus variables. Between 10 & 17 Ss were tested. Each of 11 stimuli was presented for rating 2 or 3 times. Under all conditions examined, the iterative techniques quickly led to a stable category estimation. This result was obtained for stimulus variables with strong measurement properties, e.g., length and weight; for stimulus variables with only ordinal properties, e.g., emery papers; and for stimulus variables with only nominal properties, where an ordered set is obtained only in the course of the category scaling, e.g., female profiles.

R 8

25,737

Wyke, Maria. COMPARATIVE ANALYSIS OF PROPRICEPTION IN LEFT AND RIGHT ARMS. *Quart. J. exp. Psychol.*, May 1965, *XVII*(Part 2), 149-157. (Neurosurgery Dept., National Hospital, Maida Vale, London, England).

Using the "kinaesthetic memory for the target" technique, differences in the accuracy of pointing to a target with the right and left arms are analysed. The effect of rotation of the head to left and right upon this process is also studied. 24 Ss were used, 22 of which were right handed. With the head normally orientated, it was found that pointing with the right arm is significantly better than with the left. Accuracy of pointing is greater with the target directly in front of the body than when it lies to either left or right side. When the head is rotated, the direction of the pointing error is inversely related to the direction of rotation. The study suggests that the precision of control over arm (in the absence of vision) is related to the varying ability of individual Ss to correlate limb movements with the prevailing orientation of the body, especially of the head and neck. This is additional to the influences of genetically-determined handedness and of the sensory input from the moving limb.

R 8

25,738

Dyal, J.A., Wilson, W.J. & Berry, K.K. ACQUISITION AND EXTINCTION OF A SIMPLE MOTOR SKILL AS A FUNCTION OF DELAY OF KNOWLEDGE OF RESULTS. *Quart. J. exp. Psychol.*, May 1965, *XVII*(Part 2), 158-162. (Texas Christian University, Fort Worth, Tex.).

The present experiment demonstrates that the effects of delay of knowledge of results (KR) in a line drawing task depend upon the dependent variable which is considered and the original response tendency of the Ss. 54 Ss were used and delay of KR was found to interfere with the acquisition of the correct response when number of correct responses was the dependent variable. When KR was omitted the immediate-KR group continued to make more correct responses than the delayed-KR group. However, there was a significant reduction in correct responses for both groups. When absolute error was the response measure there were no significant differences between immediate- and delayed-KR groups either during acquisition or extinction. Analysis of the type of response made during extinction suggested that the over-shooting effect obtained by previous investigators may be typical of short responders trained under conditions of immediate reinforcement but not of those trained under delayed-KR.

R 8

25,739

Butler, J. VISUAL DISCRIMINATION OF SHAPE BY HUMANS. II. *Quart. J. exp. Psychol.*, May 1965, *XVII*(Part 2), 163-168. (Psychological Lab., University of Exeter, Exeter, England).

2 experiments are described in which an attempt was made systematically to vary 2 dimensional shapes according to a pre-arranged design. In the first 10 Ss were presented tachistoscopically with pairs of "reflexive matrix figures" whose members were either horizontally or vertically orientated; and it was found that reaction times to horizontal pairs were faster than to vertical ones, a result that is in keeping with previous findings. In the second experiment (10 Ss) 2 ensembles were devised that were alike in every respect save that 1 group was extended or reduced vertically while the other varied horizontally. Performance was better on the vertically orientated ensemble. These findings are briefly related to former studies and the pre-eminence of vertical symmetry is underlined.

R 12

25,740

Anstis, S.M., & Gregory, R.L. THE AFTER-EFFECT OF SEEN MOTION: THE ROLE OF RETINAL STIMULATION AND OF EYE MOVEMENTS. *Quart. J. exp. Psychol.*, May 1965, XVII(Part 2), 173-174. (Psychological Lab., University of Cambridge, Cambridge, England).

An experiment is described in which movement after-effects are noted, following presentation of moving stripes under various conditions of eye movement. 6 Ss inspected a field of horizontally moving stripes for 45 sec. After this stimulation, they immediately looked at a randomly patterned surface and reported the presence and direction of any after-effect. The stimulus field was composed of 3 mm. black and white stripes, moving to the right at 10 mm./sec. surface speed ( $3/4^\circ$  visual angle per sec.). A fixation spot was visually superimposed via a half silvered mirror: it could be stationary or moving. The "eye/head" and the image/retinal systems were stimulated separately and together to establish which system mediates the after-effect. It was found that after-effects only occur when the retinal image moves systematically across the retina, though movements may be observed when this is not the case. The after-effects are due to specifically retinal stimulation, not to perception of movement per se. (HEIAS)

R 2

25,741

Baddeley, A.D., Conrad, R. & Hull, A.J. PREDICTABILITY AND IMMEDIATE MEMORY FOR CONSONANT SEQUENCES. *Quart. J. exp. Psychol.*, May 1965, XVII(Part 2), 175-177. (Applied Psychology Research Unit, MRC, Cambridge, England).

2 measures which have been shown to predict the ease of learning trigrams, namely, log letter frequency and sequential predictability, were applied to data from an experiment on short term memory. This involved the immediate recall of 120 6-letter consonant sequences which were presented visually 1 letter at a time. A significant correlation was found between the probability that a given sequence would be recalled correctly and both its mean log letter frequency ( $r=0.308$ ,  $p<0.001$ ), and its mean predictability ( $r=0.393$ ,  $p<0.001$ ). Partial correlation showed only a marginally significant effect of log letter frequency when predictability was partialled out ( $r=0.161$ ,  $0.05<p<0.1$ ). With log letter frequency partialled out, however, a reliable correlation between predictability and recall score remained ( $r=0.300$ ,  $p<0.001$ ).

R 16

25,742

Wickelgren, W.A. SHORT-TERM MEMORY FOR REPEATED AND NON-REPEATED ITEMS. *Quart. J. exp. Psychol.*, Feb. 1965, XVII(Part 1), 14-25. (Psychology Dept., Massachusetts Institute of Technology, Cambridge, Mass.).

2 experiments are described. In Exp. I, 26 Ss were given sequences of digits of lengths 6, 7, 8, 9, & 10 presented at the rate of 1 digit per sec. Ss had a 20 sec. interval between the end of 1 sentence and the beginning of the next sequence in which to record, in order, the sequence just heard. 17 of the 20 sequences presented in the last contained repeated items. Exp. II differed in that the rate of presentations was 5 digits per sec. It was found that digit sequences containing repeated items are retained differently in short-term memory from sequences containing no repeated items. The important variables were: a) the number of times an item is repeated; b) the number of items repeated; c) the number of items intervening between the occurrences of a repeated item; and d) the position of the repeated items in relation to the beginning and end of the sequence. Memory for the non-repeated items in sequences with repeated items was better than for the corresponding items of all-different sequences. The negative effects in memory for repeated items and the positive effects in memory for non-repeated items are greater when the items are presented at the rate of 5 per sec. than at 1 per sec., contrary to the hypothesis that differential rehearsal is responsible for these effects. The results are interpreted as supporting an "associative", as opposed to a "non-associative", theory of short-term memory, as this distinction is defined in the paper.

R 5

25,743

Herman, L.M. STUDY OF THE SINGLE CHANNEL HYPOTHESIS AND INPUT REGULATION WITHIN A CONTINUOUS SIMULTANEOUS TASK SITUATION. *Quart. J. exp. Psychol.*, Feb. 1965, XVII(Part 1), 37-46. (Psychology Dept., Queens College, New York City University, New York, N.Y.).

40 Ss performed simultaneously on an auditory tracking and an auditory discrimination task, with each task presented to a separate ear. Information transmitted on the tasks was measured as a function of ability to predict task characteristics, input information-rate, and input discriminability. Based on comparison of single- vs simultaneous-task performance, support was found for a single, central decision-type channel in information processing, having as 1 primary limit the rate at which information can be accepted. Discriminability of inputs also was found to be a limit on information processing rate. Although ability to predict a task's characteristics facilitated performance on that task, in this experiment it did not result in facilitation of performance on the second task. Relevance of these findings to certain aspects of Broadbent's information-processing model is discussed.

R 11

25,744

Murray, D.J. VOCALIZATION-AT-PRESENTATION AND IMMEDIATE RECALL, WITH VARYING PRESENTATION RATES. *Quart. J. exp. Psychol.*, Feb 1965, XVII(Part 1), 47-56. (Psychological Lab., Cambridge, England).

An experiment is reported in which the S read visually presented lists with 4 different degrees of vocalization; immediately after reading each list he was required to reproduce it either aloud or in writing. Each list consisted of 8 consonants and presentation rates were varied between 1 & 14 letters per sec. For any given series of lists, the S was asked either to read the letters silently, or to mouth them silently, or to whisper them, or to say them aloud while reading. At the fastest presentation-rate immediate recall improved monotonically with the degree of vocalization during reading of the lists; at slower rates this generalization held less well, especially for the lower degrees of vocalization. Vocalization was most helpful at the highest presentation-rate. The overall amount correctly recalled was better for more slowly presented lists and for written as opposed to spoken recall. Analysis of the errors suggested that acoustic confusions were affected by the conditions of presentation; and that serial order intrusions were independent of presentation- or recall-conditions. An apparent variation of transpositions with voicing-and-recall-method failed to reach statistical significance. Theoretical implications of the experiment are discussed, including reference to Broadbent's theory of short-term memory (1958).

R 23

25,745

Haslam, Diana R. THE INFLUENCE OF STIMULUS SCALE-INTERVAL UPON THE ASSESSMENT OF PAIN THRESHOLD. *Quart. J. exp. Psychol.*, Feb. 1965, XVII(Part 1), 65-68. (Psychology Dept., University of Bristol, Bristol, England).

An experiment concerning the influence of the scale of stimulus values upon the perception of heat-pain is reported. 3 different scales of stimulus values were used in the assessment of pain threshold. 98 Ss were divided into 3 groups. For all Ss, the energy level of the first stimulus was 98 mc./sec./cm<sup>2</sup> which the majority of Ss described as warm. In Group A (42 Ss) the stimuli were successively increased by approximately 32 mc./sec./cm<sup>2</sup>. In Group B (35 Ss) they were increased in steps of approximately 16 mc./sec./cm<sup>2</sup>, and in Group C in steps of 8 mc./sec./cm<sup>2</sup>. It was found that the value of the threshold stimulus is dependent upon the size of the steps between successive stimuli. Although there was very little difference between the mean pain thresholds of Groups A and B, the threshold of Group C was significantly lower than that of Group B. The results are analysed in the light of a paper by Brown & Cane (1959) in which they point out that the value of a sensory threshold yielded by the Limiting Method is mathematically dependent upon the size of the steps between successive values of the variable stimulus. The threshold values reported here are found to be dependent on the step-size between stimuli to a greater extent than that which would be predicted by Brown & Cane. In view of these results, an attempt is made to explain the wide variety of pain threshold values reported in the literature.

R 10

25,746

Davis, R. EXPECTANCY AND INTERMITTENCY. *Quart. J. exp. Psychol.*, Feb. 1965, XVII(Part 1), 75-78. (Psychology Dept., University of Reading, Reading, England).

When a human S responds to the second of 2 closely succeeding stimuli, his reaction time to the second stimulus tends to increase sharply as the interstimulus interval decreases. Controversy has centered on the issue of whether this increase is mainly due to the effects of the first stimulus in producing some kind of block in the central analysing systems or whether it is mainly due to the temporal uncertainty of the second signal, as determined by the distribution of interstimulus intervals used. In an experiment designed to test this, 2 Ss were used. The interval between the S pressing the trigger key and the onset of the subsequent visual signal was varied randomly from 50 to 500 millisecc. steps. By substituting for the first stimulus a spontaneous response on the part of the S and holding the distribution of interstimulus intervals constant, it is shown that the delays in responding to the succeeding signal are eliminated, even at intervals as short as 50 millisecc. This is interpreted as evidence in support of the intermittency hypothesis and as a clear indication that the increase in reaction times normally observed is not a result of the distribution of interstimulus intervals.

R 20

25,747

Kaswan, J., Young, S. & Nakamura, D.Y. STIMULUS DETERMINANTS OF CHOICE BEHAVIOR IN VISUAL PATTERN DISCRIMINATION. *J. exp. Psychol.*, May 1965, 69(5), 441-449. (University of California, Los Angeles, Calif.).

5 Ss participated in a forced-choice, pattern-recognition study. In each of a total of 10 sessions, Ss were required to identify tachistoscopic presentations from a set of 2 or 3 patterns. In separate sessions each S received 1 set of 3 patterns and 3 subsets of 2 patterns, the latter containing all the possible combinations of the 3-alternative set. Exposure durations ranged from 4 to 128 msec. It was assumed that spatial distance characteristics of the patterns and exposure duration were stimulus dimensions which help determine the perception of these patterns. This assumption was used to predict: a) the order of response probabilities to each pattern at different levels of exposure duration; b) the accuracy of pattern identification as a function of exposure duration; and c) the response probabilities to each pattern in 2-alternative sets from the responses to these patterns in the 3-alternative set. The predictions were generally confirmed, indicating that these stimulus dimensions may contribute substantially to the determination of choice behavior.

R 8

25,748

Yates, A.J. EFFECTS OF DELAYED AUDITORY FEEDBACK ON MORSE TRANSMISSION BY SKILLED OPERATORS. *J. exp. Psychol.*, May 1965, 69(5), 467-475. (University of New England, Armidale, New South Wales, Australia).

3 experiments were carried out on the effects of delayed auditory feedback (DAF) on the transmission of letters by 6 skilled Morse code operators. In the first experiment, random sequences of 8 letters were transmitted under 3 conditions (each letter transmitted separately, continuously at preferred rate, or continuously as fast as possible) at a constant delay time of 180 msec. In the second experiment, the same sequences were transmitted as fast as possible at delays varying from 30 to 300 msec. as well as under no delay. In the third experiment, meaningful material was transmitted as fast as possible under a delay of 180 msec. The results showed that DAF produces a great increase in the number of errors made; that the errors almost always involve an additional symbol or symbols; and that letters involving 3 or 4 symbols produce many more errors than letters involving 1 or 2 symbols.

R 9

25,749

Poulton, E.C., Simmonds, D.C.V., Warren, R.M. & Webster, J.C. PRIOR CONTEXT AND FRACTIONAL VERSUS MULTIPLE ESTIMATES OF THE REFLECTANCE OF GRAYS AGAINST A FIXED STANDARD. *J. exp. Psychol.*, May 1965, 69(5), 496-502. (Applied Psychology Research Unit, MRC, Cambridge, England).

850 unsophisticated Os each made multiple estimates of darkness or fractional estimates of lightness on the same gray variables against a white standard called 1 or 100, respectively. On a normal plot the median estimates were approximately linear against reflectance. The multiple estimates were linear against the fractional estimates, whereas a reciprocal relationship is predicted by transducer theory. The slope depended upon the order of the variables; the ratio of the greatest to the smallest slope ranged between 2.1 & 1.2 to 1 ( $p < .01$  or better). Conclusion: unsophisticated Os can estimate sensory magnitudes systematically, but the nature and size of the units they use are determined by present and prior experimental conditions.

R 10



25,750

Stevens, S.S., Guirao, Miguelina & Slawson, A.W. LOUDNESS, A PRODUCT OF VOLUME TIMES DENSITY. J. exp. Psychol., May 1965, 69(5), 502-510. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

Experiments were designed to determine the relation between loudness and 2 other auditory attributes, volume (apparent size) and density (apparent compactness or concentration). 2 sets of stimuli, quarter-octave bands of noise covering a wide range of center frequencies and SPL, were presented through earphones to Os who made magnitude estimations of one or another of the attributes. The loudness estimations were plotted against loudness level and found to agree with the sone scale. A plot of the estimations of loudness against the product of the estimations of volume times the estimations of density produced a slope of 1.0 in log-log coordinates. Loudness is therefore proportional a volume times density. This relation was confirmed by experiments involving magnitude estimations of the inverse attributes, softness, smallness, and diffuseness. These inverse attributes were found to be the reciprocals of their respective direct attributes. As predicted, softness turned out to be proportional to the product of smallness times diffuseness. Thus magnitude estimations of both the attributes and their inverses established the proportionality between loudness and the product of volume times density.

R 9

25,751

Kaswan, J. & Young, S. EFFECT OF STIMULUS VARIABLES ON CHOICE REACTION TIMES AND THRESHOLDS. J. exp. Psychol., May 1965, 69(5), 511-514. (University of California, Los Angeles, Calif.).

For 8 different groups of Ss, individual patterns from sets of either 4-, 3-, or 2-alternative patterns were shown to each S under 2 conditions in a forced-choice recognition task. In 1 condition, exposure duration was varied by E and thresholds were determined for each pattern. In the other condition, choice reaction times (CRT) were obtained, measured from stimulus onset to S's key press. It was predicted and found that the order of CRTs would parallel the order of thresholds in each combination of patterns. This finding supports the assumption that the time required to receive spatial information sufficient to distinguish patterns is an identifiable component of CRT.

R 2

25,752

Winnick, Wilma A. & Rogoff, Ilana. ROLE OF APPARENT SLANT IN SHAPE JUDGMENTS. J. exp. Psychol., June 1965, 69(6), 554-563. (Queens College, City University of New York, Flushing, N.Y.).

2 parallel experiments are reported bearing on the shape-slant invariance hypothesis. Apparent-objective slant scales were first determined for 4 rectangles, 2 trapezoids, a random shape, and an ellipse. Apparent slant was found to be less than objective slant at 10°, 20°, & 30°, and to be greater at 60° & 80°; accuracy was achieved at close to 40°. Shape judgments were then measured for the same forms set at the same angles. The obtained increases in the quantity  $a - p$  as a function of slant agreed with predictions from the slant scales. Not predicted was the finding of overconstancy at 10° & 20°.

R 14

25,753

Raab, D.H. & Grossberg, M. REACTION TIME TO CHANGES IN THE INTENSITY OF WHITE NOISE. J. exp. Psychol., June 1965, 69(6), 609-612. (Brooklyn College, City University of New York, Brooklyn, N.Y.).

Simple reaction times were measured to noise bursts added to background noise which covered a range of 60 db. S/N was varied between 0.63 and 10<sup>7</sup> (-2 db & 70 db). Reaction time for a noise burst ( $\Delta I$ ) added to ongoing noise (I) was found to decrease with increasing  $\Delta I$  and with decreasing I. For constant values of  $\Delta I/I$ , reaction time generally decreases with increasing I. It was concluded that if decision models are to be used to describe simple RT to partially masked stimuli, they will have to be different from the detection models correctly employed. (HEIAS)

R 17

25,754

Bourne, L.E., Jr., Guy, D.E., Dodd, D.H. & Justesen, D.R. CONCEPT IDENTIFICATION: THE EFFECTS OF VARYING LENGTH AND INFORMATIONAL COMPONENTS OF THE INTERTRIAL INTERVAL. J. exp. Psychol., June 1965, 69(6), 624-629. (University of Colorado, Boulder, Colo.).

In Exp. I, Ss solved concept-identification problems under conditions formed by combining: 4 intertrial durations (1-25 sec.); 2 levels of task complexity (1 & 5 irrelevant stimulus dimensions); and 2 modes of controlling duration of stimulus patterns (self-paced vs fixed interval). Performance (a) improved, then got worse with increases in the interval, the optimal length being greater in more complex problems, and (b) was unaffected by mode of stimulus control. In Exp. II, Ss served in 4 intertrial conditions: a) simple time-out alone; b) display of stimulus pattern; c) display of signal indicating response correctness; or d) both b and c. 3 intertrial durations were used for each condition: 1, 15, or 29 sec. Trends were the same, but performance did not worsen during longer intervals under Conditions b and d.

R 5

25,755

Rodwan, A.S. COHERENCE DETECTION: A BASIC MECHANISM. J. exp. Psychol., July 1965, 70(1), 57-62. (Emory University, Atlanta, Ga.).

This study was designed to test 2 hypotheses about perception: the subjective-standards hypothesis and a coherence-detection theory. The stimulus set consisted of 100 plane figures. 3 Ss were required to decide whether the stimulus was a square or a rectangle, or later whether it was a tall rectangle or a short rectangle. 10 other Ss were required to decide whether the stimulus was a tall rectangle, a square, or a short rectangle. The results showed that: a) Ss were reliable; b) the basis for the judgments was identical; c) a vertical-horizontal illusion exists; and d) there was no significant difference between the mean subjective square and the mean subjective short rectangle. The inference drawn is that "square" is a response label and not a perceptual category.

R 11

25,756

Cross, D.V., Lane, H.L. & Sheppard, W.C. IDENTIFICATION AND DISCRIMINATION FUNCTIONS FOR A VISUAL CONTINUUM AND THEIR RELATION TO THE MOTOR THEORY OF SPEECH PERCEPTION. J. exp. Psychol., July 1965, 70(1), 63-74. (Language & Language Behavior Research Center, University of Michigan, Ann Arbor, Mich.).

The motor theory of speech perception maintains that articulatory movements and their sensory effects mediate between the acoustic stimulus and the event we call perception. The inference of mediating articulation is based on certain properties of identification and discrimination functions for synthetic speech continua, namely, categorical identification and enhancement of discrimination at the boundary between identification classes. Identification and discrimination functions with these properties also were obtained in the present experiment, although a nonspeech (visual) continuum was employed. It is concluded that the postulation of a special perceptual mechanism for speech perception is not warranted.

R 13

25,757

Bilodeau, Ina McD. TRANSFER OF TRAINING ACROSS TARGET SIZES. J. exp. Psychol., Aug. 1965, 70(2), 135-140. (Tulane University, New Orleans, La.).

The present paper deals with an instructional manipulation of target size or width of tracking path in an S-paced tracking task: E verbally defined the limits of correct responding the limits varying from treatment to treatment. After extended training under 1 path width, S was tested with the same or a different path width. 2 experiments completed the 9 factorial combinations of the 3 values of path width used. Transfer of training was positive in all cases, but the amount of transfer declined as the difference between training- and test-target limits increased. Very regular generalizationlike functions were obtained when amount of transfer was plotted against magnitude of the shift in path width; direction of the shift was apparently irrelevant.

R 11

25,758

Weissman, S. & Freeburne, C.M. RELATIONSHIP BETWEEN STATIC AND DYNAMIC VISUAL ACUITY. J. exp. Psychol., Aug. 1965, 70(2), 141-146. (USN Medical Research Lab., Groton, Conn. & Bowling Green State University, Bowling Green, Ohio.).

Research in the area of dynamic visual acuity (DVA) has pointed out a controversy as to the nature of the relationship between DVA and static acuity. This study tried to answer the following questions: a) Is there a relationship between static acuity and DVA at any speed; b) if there are relationships at different speeds, are they different kinds of relationships? 30 women, college students, were given 6 speed (20, 60, 90, 120, 150, & 180"/sec) and 1 static measure of acuity. Thresholds for the first 4 speeds were found to show a significant linear relationship with the static acuity thresholds. The relationship disappeared at the 2 highest speed thresholds.

R 6

25,759

Seibel, R., Christ, R.E. & Teichner, W.H. SHORT-TERM MEMORY UNDER WORK-LOAD STRESS. J. exp. Psychol., Aug. 1965, 70(2), 154-162. (Pennsylvania State University, University Park, Penn.).

Work-load stress was manipulated in terms of conditions which determine informational input rate and internal processing rate as factors which produce a breakdown in performance as a result of overloading short-term memory. Slides containing letters were projected. The number of letters on each slide, defined as the "load", was 4, 5, 6, or 7. After a sequence of slides were projected an instruction slide was presented which told S on which slide he was to report. 3 experiments were performed on a total of 42 Ss. The results suggest that high input rates are ineffective as work-load stressors because S limits the amount of information he will accept at any one time. The rate at which S must extract information from memory is a variable which at high levels results in a breakdown in performance. (HEIAS)

R 7

25,760

Creelman, C.D. DISCRIMINABILITY AND SCALING OF LINEAR EXTENT. J. exp. Psychol., Aug. 1965, 70(2), 192-200. (University of Toronto, Toronto, Ontario, Canada).

Discrimination between lengths of printed lines was measured by 4 operationally different experimental techniques. 3 of the techniques (single stimuli, absolute judgment, and a modification of the method of constant stimuli) yielded psychophysical scales which were consistent with each other and with the theory of signal detectability (TSD). In the fourth experimental procedure stimuli had unequal a priori probabilities. This produced consistently higher measures of discrimination. A possible explanation for this obtained discrepancy is the lack of long-term learning under this task as opposed to the others. The results extend the applicability of TSD to some further judgment tasks and experimental conditions.

R 13

25,761

Crovitz, H.F. & Schiffman, H.R. VISUAL FIELD AND THE LETTER SPAN. J. exp. Psychol., Aug. 1965, 70(2), 218-223. (US Veterans Administration Hospital, Durham, N.C. & University of North Carolina, Charlotte, N.C.).

3 experiments tested the relations between monocular or binocular viewing, visual-field placement of stimuli, and interletter spacing in the distribution of errors over letter positions in the letter span. Exposure time was 100 msec. The most important variable in accuracy within the letter span was found to be the relative location of a letter within the 8-letter line. Errors were fewest for the leftmost letter in the line regardless of variations in absolute retinal locus. These data imply that experiments on the letter span might better be conceptualized as "memory" studies than as "perception" studies.

R 9

25,762

Messick, D.M. & Rapoport, A. EXPECTED VALUE AND RESPONSE UNCERTAINTY IN MULTIPLE-CHOICE DECISION BEHAVIOR. J. exp. Psychol., Aug. 1965, 70(2), 224-230. (University of North Carolina, Charlotte, N.C.).

A 10-choice decision-making experiment was conducted in which the uncertainty,  $H$ , of S's response distributions was experimentally determined for each of 4 blocks of 80 trials. A measure of relative efficiency in terms of expected gain which assumes  $H$  constant,  $R_t$ , was computed for each S for each block of trials. Analysis indicated that  $R_t$  did not depend on  $H$  and that it increased slightly but significantly with blocks. The absolute values of  $R_t$  were quite close to the maximum in the later blocks, suggesting that when the uncertainty of the responses is accounted for, Ss perform the task in nearly optimal fashion. Some implications of these results for "rational" theories of decision making are discussed.

R 3

25,763

Bell, C.R. TIME ESTIMATION AND INCREASES IN BODY TEMPERATURE. *J. exp. Psychol.*, Aug. 1965, 70(2), 232-234. (London School of Hygiene and Tropical Medicine, MRC, London, England).

In an attempt to replicate some early experiments which had shown consistent between-Ss changes in time estimation with increases in body temperature, Ss in the present experiments were required to: a) count to 60 at an estimated rate of 1 digit/sec; b) tap a Morse key at an estimated rate of 3 taps/sec; and c) judge when a metronome was beating at 4 beats/sec. Body (oral) temperatures were raised by immersion of both legs below the knees in a bath of warm water. These trials were given at each task at 3 levels of body temperature. The results of the original experiments were not confirmed.

R 5

25,764

DiLollo, V. & Casseday, J.H. GRADED CONTRAST EFFECTS IN THE JUDGMENT OF LIFTED WEIGHTS. *J. exp. Psychol.*, Aug. 1965, 70(2), 234-235. (University of Western Australia, Perth, Australia & Indiana University, Bloomington, Ind.).

6 groups of 16 Ss each judged the heaviness of either a heavy series (H) or a light series (L) of weights for either 2, 6, or 10 trials and were then shifted to the opposite series for 15 additional trials. 2 nonshifted groups acted as controls. Before the shift H was judged heavier than the L. After the shift H was judged as heavier by the shift-up groups than by the H controls (positive contrast effect), and L was perceived as lighter by the shift-down groups than by the L controls (negative contrast effect). The magnitude of the contrast effects was directly related to the number of preshift trials, in accordance with predictions from adaptation-level theory.

R 2

25,765

Rice, C.E., Feinstein, S.H. & Schusterman, R.J. ECHO-DETECTION ABILITY OF THE BLIND: SIZE AND DISTANCE FACTORS. *J. exp. Psychol.*, Sept. 1965, 70(3), 246-251. (Stanford Research Institute, Menlo Park, Calif.).

The ability of 5 blind Ss to detect metal discs placed in front of them by use of echoes was measured. S was instructed and trained to respond to the presence or absence of these targets after uttering any sound of his choice. Response thresholds were obtained for various size targets at distances ranging from 24 to 108 in. As distance increased, threshold target size increased. The mean auditory angle subtended by a target calculated to be at threshold was 4.63° with an SD of .21°. These data provide a basis for comparing performance using a vocal echo signal with performance using signal characteristics as independent variables.

R 8

25,766

Trumbo, D., Noble, M., Cross K. & Ulrich, Lynn. TASK PREDICTABILITY IN THE ORGANIZATION, ACQUISITION, AND RETENTION OF TRACKING SKILL. *J. exp. Psychol.*, Sept. 1965, 70(3), 252-263. (Kansas State University, Manhattan, Kan.).

250 male students were assigned to 4 conditions of task predictability, 3 retention intervals, and 2 levels of training in a 4x3x2 design. Predictability was determined by irregular step-function tasks that differed in the proportions of systematically repeating (predictable) targets, ranging from fixed to random sequences. Integrated absolute error served as a performance criterion. In addition, 6 indexes of temporal-spatial patterning were obtained. Results showed greatest improvement and greatest absolute retention losses for the fixed task and a fixed-direction task added to the design. Intermediately predictable tasks did not differ in error from the random task; however, differences in response organization were found among all tasks. Results suggest the nature of changes in response organization, and indicate that timing may be most crucial for acquiring and maintaining skill.

R 25

25,767

Morin, R.E., Konick, A., Troxell, Nola & McPherson, Sandra. INFORMATION AND REACTION TIME FOR "NAMING" RESPONSES. *J. exp. Psychol.*, Sept. 1965, 70(3), 309-314. (Kent State University, Kent, Ohio).

The relationship between stimulus information (1, 2, or 3 bits) and reaction time (RT) was investigated for 5 types of associations all of which required naming responses to familiar stimuli (Exp. I--faces of fraternity brothers; Exp. II--line drawings of animals; Exp. III--colors; Exp. IV--geometric symbols; Exp. V--letters of the alphabet). Each of 54 Ss served in 3 information conditions of 1 of the 5 experiments. The observed slope for letters, marked increases in RT accompanied changes in stimulus information, and all curves were negatively accelerated. The results indicate that a high degree of overlearning is not sufficient to produce independence of RT and information measures. A response-competition hypothesis is suggested to account for differences between the results with letters and other stimuli.

R 14

25,768

Laughlin, P.R. SELECTION STRATEGIES IN CONCEPT ATTAINMENT AS A FUNCTION OF NUMBER OF PERSONS AND STIMULUS DISPLAY. *J. exp. Psychol.*, Sept. 1965, 70(3), 323-327. (Northwestern University, Evanston, Ill.).

The selection strategies of individuals and 2-person cooperative groups were investigated in 5 concept-attainment problems. 2 types of stimulus displays were used: a) form displays, consisting of geometric forms varying in 6 attributes with 2 levels of each; b) sequence displays, consisting of 6 plus and/or minus signs in a row. The arrangement of cards in the stimulus displays was ordered or random. The principal results were: a) 2-person groups used the focusing strategy more, required fewer card choices to solution, and required more time than individuals; b) form displays resulted in more use of the focusing strategy than sequence displays, with no difference in number of card choices; c) no difference between ordered and random arrays in use of the focusing strategy or number of card choices.

R 6

25,769

Watkins, W.H. & Feehrer, C.E. ACOUSTIC FACILITATION OF VISUAL DETECTION. J. exp. Psychol., Sept. 1965, 70(3), 332-333. (USAF Decision Sciences Lab., Bedford AFB, Mass.).

11 Os were required to judge which of 4 temporal intervals contained a visual signal, in an experiment involving a total of 10,900 trials. Under some conditions, potentially useful time information was conveyed by accompanying sound stimulation, while it was lacking under others. Highest detectability of the signal was associated with an acoustic condition having white noise bursts coincident with each observation interval. Those detection scores were significantly superior to a "reciprocal" condition having the identical amount of acoustic time-specification information. Detection was poorest under continuous noise and silence, which were not discernably different in their effects. Simple time cueing was inferred not to provide an adequate explanation for the results.

R 3

25,770

Eriksen, C.W. & Collins, J.F. REINTERPRETATION OF ONE FORM OF BACKWARD AND FORWARD MASKING IN VISUAL PERCEPTION. J. exp. Psychol., Oct. 1965, 70(4), 343-351. (University of Illinois, Urbana, Ill.).

2 experiments were performed on the masking effect of a ring stimulus upon forced-choice recognition of letter forms when the ring was presented concurrently with the form or preceding or following the form at delay intervals up to 250 msec. 10 Ss were employed in Exp. I (backward masking) and 10 in Exp. II (forward masking). Masking effects on recognition accuracy were obtained for delay intervals as long as 80 msec. Maximum masking occurred when ring and form occurred concurrently. The masking functions obtained for forward and backward masking appeared highly similar if not identical. An interpretation was suggested in terms of visual perceptual persistence where masking is due to the greater difficulty of perceiving a form surrounded by a black ring. Possible perceptual mechanisms for the persistence were considered.

R 19

25,771

Sekuler, R.W. SPATIAL AND TEMPORAL DETERMINANTS OF VISUAL BACKWARD MASKING. J. exp. Psychol., Oct. 1965, 70(4), 401-406. (Northwestern University, Evanston, Ill.).

Duration thresholds were obtained for a single test stripe succeeded by a masking pattern of alternating dark and bright bars delivered to the same retinal region. The effect of the angle ( $\alpha$ ) between test stripe and masking contours was studied in conjunction with both vertical and horizontal test stripes. With either of the test-stripe orientations duration threshold decreased as  $\alpha$  increased from  $0^\circ$  to  $90^\circ$ . In another experiment both  $\alpha$  and the interstimulus interval (ISI) were varied. The effectiveness of  $\alpha$  as a determinant of masking seemed to be restricted to ISI below 60 msec.

R 13

25,772

Corso, J.F. & Levine, M. SONIC AND ULTRASONIC EQUAL-LOUDNESS CONTOURS. J. exp. Psychol., Oct. 1965, 70(4), 412-416. (New York State University, Cortland, N.Y. & USA Aberdeen Proving Ground, Aberdeen, Md.).

Equal-loudness contours were established and compared for 18 Os tested by air conduction from 2000 cps to 16,000 cps and for 30 Os tested by bone conduction from 2000 cps to 94,000 cps. Contours were established for both modes of transmission at 0-, 10-, and 20-phon loudness levels. The results indicate that the curves for the 2 modes are essentially similar up to 14,000 cps, approximately; however, the extrapolated air-conduction curves appear to converge at 17,000 cps, while the bone-conduction curves converge at 85,000 cps. It is concluded that the loudness function for human hearing extends considerably higher in frequency than previously believed.

R 17

25,773

Little, K.B. & Lintz, L.M. INFORMATION AND CERTAINTY. J. exp. Psychol., Oct. 1965, 70(4), 428-432. (University of Denver, Denver, Colo.).

54 Ss were tested in an "expanded-judgment" situation to determine the increase of mean certainty in a hypothesis as a function of the amount of information provided. Under these conditions mean certainty increased as a linear function of the t ratio of the difference of the true and a hypothetical mean. Moreover, it was found that the formulation of a hypothesis is accompanied by a significant degree of certainty in its correctness prior to presentation of any information. A second experiment supported the last finding but demonstrated that mean certainty can be accurately predicted on the basis of amount of information provided only if the ratio of the variability of the information to the mean difference remains constant.

R 6

25,774

Allison, J. FIXATION TIME AS A FUNCTION OF STIMULUS UNCERTAINTY. J. exp. Psychol., Oct. 1965, 70(4), 433-434. (Indiana University, Bloomington, Ind.).

46 Ss were adapted to 1 of 3 levels of stimulus uncertainty, then tested at 1 of the 3 levels. The dependent variable was the total time S fixated stimuli available during the test period. Stimuli were 1 x 4 in. bits of paper. The low uncertainty set consisted of 42 white stimuli. The intermediate uncertainty set consisted of 14 white, 14 blues, and 14 reds. The high uncertainty set consisted of 43 stimuli, each forming a unique combination of hue, brightness, and saturation. The adaptation period was 14 min. for each set. The design was a 3x3 factorial with 3 levels of stimulus uncertainty during adaptation, and 3 during test. The Ss shifted from a lower to a higher level of uncertainty fixated longer than those shifted from a higher to a lower level, and this effect increased with the magnitude of the shift ( $p < .01$ ). (HEIAS)

R 3

25,775

Karlin, L. EFFECTS OF DELAY AND MODE OF PRESENTATION OF EXTRA CUES ON PURSUIT-ROTOR PERFORMANCE. *J. exp. Psychol.*, Oct. 1965, 70(4), 438-440. (New York University, New York, N.Y.)

The effects on pursuit-rotor performance of using an extra cue and varying its mode of presentation were investigated in order to examine the reasons for previous results that were in conflict. It had been found that when auditory clicks are sounded when S is on target, superior performance results. In this experiment 80 Ss were tested under 5 conditions: one control group and 4 groups with auditory feedback of .5 and .2 sec. continuous, and .5 and .2 sec. discrete. The continuous tone was sounded following either a .2 or .5 sec. interval of continuous time on target and kept sounding as long as S remained on target. The discrete tone sounded when S maintained continuous contact for the requisite amount of time and was repeated for equal intervals of continuous time on target thereafter. An extra cue was found to be effective in increasing performance, but variations in the interval of delay were not significant. (HEIAS)

R 3

25,776

Ludwig, A.M. & Polak, P.R. SOME DIFFICULTIES WITH TACHISTOSCOPIC RESEARCH. *J. gen. Psychol.*, Jan. 1965, 72(First Half), 101-109. (Mendota State Hospital, Madison, Wisc. & Fort Logan Mental Health Center, Fort Logan, Colo.).

This paper reports some methodological problems and previously unreported variables which play an important role in all tachistoscopic investigation. The following conclusions were reached by the writers after attempting an experiment utilizing the tachistoscope: a) Variables, such as the method of stimulus construction should be reported in tachistoscopic experiments if the experiment is to be repeatable; b) Dark adaptation, or the absence of it, does not appear to affect the threshold of recognition of tachistoscopically presented word stimuli; c) Findings suggest that subjects, when anxious, have a more difficult time perceiving "threat" words compared to "nonthreat" words. After 15 minutes of adaptation, no significant differences between so-called "threat" and "nonthreat" words were found that were not related to the physical properties of the stimuli; d) The number of times each stimulus is presented at each shutter speed is an important determinant of threshold of recognition. The more often each stimulus is presented at each shutter speed, the lower will be the threshold. This is probably related to partial information about the stimulus gained at each exposure; e) The time period between presentations of stimuli is an important determinant of threshold. Words presented 5 sec. apart had much higher thresholds than words presented 1/3 sec. apart.

R 5

25,777

Murdock, B.B., Jr. SIGNAL DETECTION THEORY AND SHORT-TERM MEMORY. *J. exp. Psychol.*, Nov. 1965, 70(5), 443-447. (University of Toronto, Toronto, Ontario, Canada).

This study attempted to apply signal-detection theory to short-term memory by testing the high-threshold concept of associative strength. On each trial a list of 6 A-B pairs was presented once, then 1 of these 6 pairs was tested for recognition. On the recognition test either A-B (a proper pair) or A-X (an improper pair) was presented; S had to make a binary (yes-no) decision plus a confidence rating. From these data ROC curves were plotted, and they resembled the curvilinear functions of signal-detection theory more than the linear functions required by the high-threshold concept. These results call into question the use of a high-threshold concept to explain findings from studies of 1-trial learning.

R 11

25,778

Bertelson, P. & Barzelee, J. INTERACTION OF TIME-UNCERTAINTY AND RELATIVE SIGNAL FREQUENCY IN DETERMINING CHOICE REACTION TIME. *J. exp. Psychol.*, Nov. 1965, 70(5), 448-451. (Universite libre de Bruxelles, Brussels, Belgium).

Choice RTs to 2 signals of relative frequencies .2 and .8 were measured under 2 time-uncertainty conditions: constant FPs of either .5 or 5.0 sec. The RT to the more frequent signal is more affected by time uncertainty than the RT to the less frequent one. This result shows that "preparation," a hypothetical state which has often been postulated to account for time-uncertainty effects, is at least in part specific to one particular signal-response pair, or, alternatively, that the well-known effect of signal relative frequency is affected by very short-term fluctuations.

R 13

25,779

Hohle, R.H. DETECTION OF A VISUAL SIGNAL WITH LOW BACK-GROUND NOISE: AN EXPERIMENTAL COMPARISON OF TWO THEORIES. *J. exp. Psychol.*, Nov. 1965, 70(5), 459-463. (Child Behavior & Development Institute, University of Iowa, Ames, Iowa).

Yes-no responses were obtained from each of 5 Ss under different conditions of induced response bias during 9 300-trial sessions (plus 9 extra sessions for 1 S) where a low-intensity stimulus was present or absent in a random sequence. Least-squares curves relating probabilities of a "yes" response with the stimulus present to probabilities of a "yes" with the stimulus absent were determined for each set of data, assuming: a) the theory of signal detection (TSD); and b) the fixed-criterion hypothesis. The latter theory afforded a closer fit for each of the 6 sets of data when compared to the simplest form of TSD. A more general form of TSD led to curves which fit as well as those from the fixed-criterion theory, but this form has other, undesirable, implications.

R 6

25,780

Norman, D.A. & Wickelgren, W.A. SHORT-TERM RECOGNITION MEMORY FOR SINGLE DIGITS AND PAIRS OF DIGITS. *J. exp. Psychol.*, Nov. 1965, 70(5), 479-489. (Harvard University, Cambridge, Mass. & Massachusetts Institute of Technology, Cambridge, Mass.).

The operating characteristic is used to examine the relation between the recognition of a single item and the recognition of a pair of items. 29 Ss listened to a sequence of 5 digits, and then were given a test of recognition memory for 1 or 2 digits from the original sequence. The operating characteristic for single digits is a smooth function that is symmetrical about the major diagonal, whereas the curve for pairs is highly asymmetrical. False-recognition rates for test pairs containing 1 digit from the original sequence are only slightly greater than false-recognition rates for completely new pairs. Recognition of a pair does not appear to result from independent recognition of each digit. A mathematical model is developed in which the strength of the memory trace has a continuous distribution which is incremented in a probabilistic fashion upon presentation of an item or pair.

R 8

25,781

Posner, M.I. & Rossman, Ellen. EFFECT OF SIZE AND LOCATION OF INFORMATIONAL TRANSFORMS UPON SHORT-TERM RETENTION. J. exp. Psychol., Nov. 1965, 70(5), 496-505. (University of Oregon, Eugene, Ore. & University of California, Berkeley, Calif.).

This series of studies investigates the effect of informational transformations of various levels of difficulty, as indicated by the amount of information reduction required, upon material in short-term storage at the time of the transform. Exp. I shows that with number and similarity of interpolated items held constant, the greater the difficulty of a transform the more forgetting will result from it. Exps. II and III show that these effects cannot be attributed entirely to increases in the time an item remains in store. Rather, time in store and difficulty of transform both contribute to determining the amount of forgetting. Exp. IV shows that the loss of material in store is a decreasing function of its distance prior to the transform, but that the transformed material itself shows no decline in retention. These results point to an operational definition of rehearsal as a process requiring part of the limited central capacity of S.

R 17

25,782

Peterson, C.R., Ulehla, Z.J., Miller, A.J. & Bourne, L.E., Jr. INTERNAL CONSISTENCY OF SUBJECTIVE PROBABILITIES. J. exp. Psychol., Nov. 1965, 70(5), 526-533. (University of Michigan, Ann Arbor, Mich.).

3 experiments evaluated the degree to which relations within sets of subjective probabilities conformed to implications of mathematical probability theory. According to probability theory, 2 products of subjective probabilities, (a) (b/a), should be equal. The mean correlation between these products was .67 in Exp. I. The corresponding correlation was .90 in Exp. II after partialing out the effect of relevant objective probabilities. In Exp. III, Ss made trial-to-trial revisions of subjective probabilities which referred to 2 classes of events. Although the magnitude of subjective-probability revision was less than the magnitude of objective-probability revision, the relation between revised subjective probabilities associated with the 2 classes of events agreed closely with the relation specified by probability theory.

R 6

25,783

Kimmel, H.D. & Kimmel, Ellen. SEX DIFFERENCES IN ADAPTION OF THE GSR UNDER REPEATED APPLICATIONS OF A VISUAL STIMULUS. J. exp. Psychol., Nov. 1965, 70(5), 536-537. (University of Florida, Gainesville, Fla.).

8 men and 8 women came to the laboratory on 3 occasions, 1 wk. apart, to receive 10 presentations of a visual stimulus on each occasion. The average GSR to the light showed an intrasession (but no intersession) adaptation effect for both sexes but this effect was almost gone for the males on the last session. In addition, the males made significantly larger GSRs than the women on all 3 sessions, especially on the last session. It was conjectured that the men became familiar with the procedure and anticipated the end of the 3rd. session by making larger GSRs, but that the women did not.

R 2

25,784

Gould, J.D. & Schaffer, Amy. PARTIAL VISUAL FEEDBACK OF COMPONENT MOTIONS AS A FUNCTION OF DIFFICULTY OF MOTOR CONTROL. J. exp. Psychol., Dec. 1965, 70(6), 564-569. (IBM Watson Research Center, Yorktown Heights, N.Y.).

This research studied the interrelations of visual perception and movement. Closed-circuit television techniques allowed the joint action of S's hand, control instrument, and operational effects to be visually fed back singly or in various combinations. 2 levels of difficulty of each of the 3 task components responsible for the 3 types of visual feedback were varied independently of feedback in a task where S steered a ball through a maze. Results showed vision of the tool to be most important followed by vision of operational effects and hand-arm movements. No significant difference was found on the task-difficulty variable which may have influenced the absence of a significant interaction between type of visual feedback and movement difficulty.

R 15

25,785

Corah, N.L. EFFECTS OF THE VISUAL FIELD UPON PERCEPTION OF CHANGE IN SPATIAL ORIENTATION. J. exp. Psychol., Dec. 1965, 70(6), 598-601. (Dentistry School, New York State University, Buffalo, N.Y.).

The study investigated the effects of a frame and its orientation upon the perceived change in orientation of a rod target rotated at a speed below threshold for movement. 84 Ss were equally divided among 7 conditions. The results demonstrated that field structure was generally less important than starting position of the target. Change was more readily perceived when initial target position was at the vertical than when it was tilted (p<.05). A tilted field with the target rotating away from the vertical produced the greatest lag in detection. The results are interpreted in terms of adaptation-level theory.

R 9

25,786

McAllister, W.R., McAllister, Dorothy E. & Franchina, J.J. DEPENDENCE OF EQUALITY JUDGMENTS UPON THE TEMPORAL INTERVAL BETWEEN STIMULUS PRESENTATIONS. J. exp. Psychol., Dec. 1965, 70(6), 602-605. (Syracuse University, Syracuse, N.Y.).

Judgments of equality were obtained from 8 independent groups of Ss following a comparison of a standard 50-mm. line with either a 50-, 54-, 58-, or 62-mm. line presented after either 1/2 minute or 8 minutes. Percentage of equal judgments was significantly greater following the 8-minute presentation interval than following the 1/2-minute interval only for lines longer than the standard. A second judgment by each S with the other presentation interval indicated that the effect of presentation interval depended upon the order of intervals used. The first judgment data parallel the results of several animal studies which showed an increase in response consistent with the hypothesis that the number of judgments separating 2 similar stimuli decreases as the time between presentations of the stimuli increases. This hypothesis reconciles the data with Hull's theory of stimulus generalization.

R 9

25,787

Engen, T. PSYCHOPHYSICAL ANALYSIS OF THE ODOR INTENSITY OF HOMOLOGOUS ALCOHOLS. J. exp. Psychol., Dec. 1965, 70(6), 611-616. (Brown University, Providence, R.I.).

Change in the human infant's respiration was used as an index of the intensity of homologous alcohols. At 100% concentration intensity decreases but at threshold concentration intensity increases with increasing chain length. Psychophysical scaling with adult Os indicates that the infant results are not inconsistent because the slope of the psychophysical function also decreases with increasing chain length. These findings are pertinent to olfaction as well as psychophysics.

R 14

25,788

Gescheider, G.A. CUTANEOUS SOUND LOCALIZATION. J. exp. Psychol., Dec. 1965, 70(6), 617-625. (Hamilton College, Clinton, N.Y.).

Cutaneous sound localization when stimuli were delivered to the skin through a pair of vibrators was compared with auditory localization when stimuli were presented through earphones. Auditory localization was more precise for random noise bursts than for low-frequency tones. Cutaneous localization, however, was as accurate for the tone as for the noise stimuli. Comparisons between modalities revealed that cutaneous localization of low tones was a great deal more precise than auditory localization of low tones. Localization of noise bursts, however, was slightly more accurately performed by the ears than by the skin, as was the case with 1-msec. clicks. Independent manipulation of intensity- and temporal-difference cues revealed that auditory localization was influenced by both types of cue. Cutaneous localization was found to depend mainly on intensity differences. Small time-difference effects were observed, however, and were found to depend on the locus of stimulation.

R 7

25,789

Freedman, J.L. INCREASING CREATIVITY BY FREE-ASSOCIATION TRAINING. J. exp. Psychol., Jan. 1965, 69(1), 89-91. (Stanford University, Stanford, Calif.).

An experiment was conducted to test the hypothesis that facilitating S's ability to produce associations would increase his score on a test of creativity. Ss either free associated to 10 stimulus words or defined the words. Those receiving the free-association training scored significantly higher on the Remote Associates Test (RAT), a test of creativity which was administered after the training session.

R 7

25,790

Binder, A., Wolin, B.R. & Terebinski, S.J. LEADERSHIP IN SMALL GROUPS: A MATHEMATICAL APPROACH. J. exp. Psychol., Feb. 1965, 69(2), 126-134. (Indiana University, Bloomington, Ind.).

The broad purpose of this research was the investigation of the relationship between decision-making success and the likelihood of being voted "leader" (group decision maker) of a 3-man group. Markov models, based on extensions of concepts used in mathematical learning theory, provided the theoretical framework. Each trial of the experiment began with the selection of a leader by group vote, and ended after the designated leader made a decision for the group. Obtained and predicted results were compared for voting shifts, asymptotic leadership and state proportions, and learning trends. 5 different reinforcement groups were run and in only 1 of these groups were there major discrepancies between actual and expected results.

R 8

25,791

Beck, J. APPARENT SPATIAL POSITION AND THE PERCEPTION OF LIGHTNESS. J. exp. Psychol., Feb. 1965, 69(2), 170-179. (Harvard University, Cambridge, Mass.).

2 studies investigated the relation of lightness perception to the perception of spatial position. The results confirm earlier findings that lightness perception may be affected by how an O perceives the surface to be oriented with respect to the illumination. The results fail to support the hypothesis, however, that the apparent position of a surface relative to the illumination is used as a basis for computing the albedo of a surface. Rather, the general hypothesis the studies appear to support is that processes of perceptual organization come into play as a result of the cue properties of stimuli which affect whether a variation in luminance will be seen as a difference in the illumination of the surface or as a difference in the lightness of the surface. Thus, an area of reduced surface luminance seen in one position as a shadow is, in another, seen as a gray surface color, in each case consistent with the apparent position of the surface.

R 12

25,792

Schiller, P.H. MONOPTIC AND DICHOTIC VISUAL MASKING BY PATTERNS AND FLASHES. J. exp. Psychol., Feb. 1965, 69(2), 193-199. (Massachusetts Institute of Technology, Cambridge, Mass.).

This study investigated masking of letters by a bright flash of light or by a pattern. The results showed that: a) masking by flash is primarily a monoptic effect; masking by pattern occurs under monoptic and dichoptic conditions; b) increasing the interstimulus interval decreases masking by pattern less than by monoptically presented flash; c) repetition of trials decreases masking by pattern but not by flash. Different processes are involved when flashes and patterns are used as masking stimuli.

R 15

25,793

Kintsch, W. & Morris, C.J. APPLICATION OF A MARKOV MODEL TO FREE RECALL AND RECOGNITION. J. exp. Psychol., Feb. 1965, 69(2), 200-206. (University of Missouri, Columbia, Mo.).

In 2 experiments lists of nonsense syllables were learned by the methods of recognition and recall. In a third experiment Ss first learned to recognize a list of nonsense syllables and then to recall it. The recognition data could be described by a simple 2-state Markov model. A 3-state Markov model was needed for the description of the recall data. It was hypothesized that recall learning involved 2 stages, a recognition stage and a second stage where the response becomes available in the absence of the stimulus, and that each of these stages can be described as a simple Markov process. In Exp. III it was shown that recall learning after recognition learning can actually be described by a 2-state Markov model.

R 15

25,794

Polidora, V.J. STIMULUS CORRELATES OF VISUAL PATTERN DISCRIMINATION BY HUMANS: AREA AND CONTOUR. *J. exp. Psychol.*, March 1965, 69(3), 221-223. (Wisconsin Regional Primate Research Center, Wisc.).

It was found previously found that the disparity between the areas and the contours of the 2 patterns which comprised a simultaneous discrimination problem were both direct, monotonic determinants of discriminative performance of monkeys. Also, the contributions of the area and contour dimensions were shown to be independent and additive. To determine the extent to which these same dimensions relate also to human discriminative performance, this experiment was designed as a replication of the monkey study. It was found that human proficiency of discriminating visual metric patterns was virtually perfect and less directly related to the area and contour dimensions of these patterns. (HEIAS)

R 4

25,795

Montague, W.E. EFFECT OF IRRELEVANT INFORMATION ON A COMPLEX AUDITORY-DISCRIMINATION TASK. *J. exp. Psychol.*, March 1965, 69(3), 230-236. (University of Illinois, Urbana, Ill. & USN Electronics Lab., San Diego, Calif.).

An attempt was made to demonstrate that the detrimental effects of irrelevant information on discrimination learning are due to implicit response competition generated by task conditions. In a complex auditory-discrimination task, groups receiving different amounts of irrelevant information (1, 2, or 3 dimensions) never relevant to their task made fewer errors than groups receiving different amounts of irrelevant information which sometimes required differential responding. In addition, the errors increased with the number of irrelevant dimensions. Variation of task difficulty by manipulating the discriminability of the relevant information resulted in an enhancement of the effects of the irrelevant information. Repeated practice sessions reduced the effects of irrelevant information which was sometimes relevant at a faster rate than for the irrelevant information which was never relevant to the task.

R 14

25,796

Berman, Phyllis W. & Liebowitz, H.W. SOME EFFECTS OF CONTOUR ON SIMULTANEOUS BRIGHTNESS CONTRAST. *J. exp. Psychol.*, March 1965, 69(3), 251-256. (University of Wisconsin, Madison, Wisc. & Pennsylvania State University, University Park, Penn.).

Simultaneous brightness contrast was measured as a function of: a) the orientation of a test object, shaped as a figure 8, on a half light, half black surround; b) type and width of a contour separating the figure halves on the divided background. 48 adult Ss matched the brightness of the figure half on the dark background with that on the light surround. Subjective contrast was significantly greater: a) when the figure 8 was presented with its rings on backgrounds of different brightness than when each ring lay on both backgrounds; b) when figure halves were moved apart, each into its own surround, rather than when a dividing line separated the halves; c) as width of the contour between halves was increased. The results are discussed in terms of the contribution of the border to subjective contrast obtained with complex stimulus configurations.

R 12

25,797

Gould, J.D. DIFFERENTIAL VISUAL FEEDBACK OF COMPONENT MOTIONS. *J. exp. Psychol.*, March 1965, 69(3), 263-268. (IBM Watson Research Center, Yorktown Heights, N.Y.).

New closed-circuit television techniques allowed the joint action of S's hand, control-instrument, and operational effects to be visually fed back singly or in combination. 8 visual feedback conditions and 2 levels of task precision were used. The results showed that the effects of visual feedback were determined by the component motions fed back, with the operational effects being the most important followed by control-instrument and hand-arm movements. A significant interaction between visual feedback and precision of movement occurred, where feedback of the operational component became more important as more overall precision of movement was demanded.

R 8

25,798

Grim, P.F. & White, S.H. EFFECTS OF STIMULUS CHANGE UPON THE GSR AND REACTION TIME. *J. exp. Psychol.*, March 1965, 69(3), 276-281. (University of Chicago, Chicago, Ill.).

60 Ss were given 16 RT trials using a colored light as stimulus and then, without warning, lights differing in color but not in intensity were presented. Augmented GSR reactions occurred as a monotonic function of amount of change. Lengthened RTs were also observed; the amount of such lengthening did not appear to be simply related either to evoked GSR or to amount of stimulus change.

R 12

25,799

Fillenbaum, S., Schiffman, H.R. & Butcher, J. PERCEPTION OF OFF-SIZE VERSIONS OF A FAMILIAR OBJECT UNDER CONDITIONS OF RICH INFORMATION. *J. exp. Psychol.*, March 1965, 69(3), 298-303. (University of North Carolina, Chapel Hill, N.C.).

An experiment was conducted replicating and extending an earlier study by Slack in which size estimates of off-size versions of a familiar object had been found to regress to familiar size, under conditions of rich environmental information. Size and distance estimates were obtained for normal, oversized, and undersized chairs (and control stakes and abstract constructions) located on a dirt road at various distances from S. There was no tendency for either size or distance judgments to be systematically biased as a function of familiar size; Slack's findings were not replicated. These results do not support any position which argues that familiar size is one of the major operative determinants of apparent size, under ordinary circumstances of observation in a richly informative environment.

R 10

25,800

Pick, Anne D. IMPROVEMENT OF VISUAL AND TACTUAL FORM DISCRIMINATION. *J. exp. Psychol.*, April 1965, 69(4), 331-339. (Macalaster College).

A discrimination-learning situation and subsequent transfer tests were used to investigate 2 hypotheses about improvement in discrimination: a "schema" hypothesis and a "distinctive feature" hypothesis. 1 visual and 2 tactual discrimination experiments were conducted. Results suggested the superiority of the distinctive feature hypothesis, at least under conditions of a simultaneous comparison, for accounting for children's improvement of discrimination of the letter-like forms used as material.

R 8



25,801

Singer, G. & Day, R.H. TEMPORAL DETERMINANTS OF A KINESTHETIC AFTEREFFECT. *J. exp. Psychol.*, April 1965, 69(4), 343-348. (University of Sydney, Sydney, Australia).

The development of a kinesthetic aftereffect as a function of stimulation times of 15, 30, 45, 60, 75, 90, 105, & 120 sec. and its dissipation after 30 & 90 sec. stimulation have been investigated in 2 experiments. The task required kinesthetic judgment of the horizontal following controlled rhythmic stimulation of the extended hand across a slanted bar. In Exp. I the aftereffect was shown to increase with stimulation time. In Exp. II the size of the aftereffect was similar immediately following 30 & 90 sec. stimulation but the rate of dissipation was greater for the shorter than for the longer stimulation. Since with the method of adjustment dissipation is rapid during the adjustment period, the development function of Exp. I is interpreted as representing a joint function of stimulation time and differential dissipation rates.

R 10

25,802

Bruvold, W.H. & Gaffey, W.R. SUBJECTIVE INTENSITY OF MINERAL TASTE IN WATER. *J. exp. Psychol.*, April 1965, 69(4), 369-374. (University of California, Berkeley, Calif. & California State Department of Public Health, Calif.).

An experiment determined the ability of a power function to summarize ratings given solutions of NaCl, MgCl<sub>2</sub>, and Na<sub>2</sub>SO<sub>4</sub>. 16 Ss rated 9 solutions of a salt using a magnitude-estimation procedure. A separate experiment was devoted to each of the 3 salts studied. Results indicated that a power function,  $f = k^n$ , could account for a substantial portion of the variance in the ratings given. Further analyses of individual ratings showed that power functions varied significantly between Ss. It was proposed that the individual variation could be accommodated by an analysis of variance model.

R 7

25,803

Kaswan, J. & Young, S. EFFECT OF LUMINANCE, EXPOSURE DURATION, AND TASK COMPLEXITY ON REACTION TIME. *J. exp. Psychol.*, April 1965, 69(4), 393-400. (University of California, Los Angeles, Calif.).

Reaction time to a pattern-discrimination task was found to be about equally affected by variation in exposure duration (4-512 msec.) and luminance (.09-11.84mL). In a supplementary study of figure-ground detection, it was found that luminance affected RT to a greater extent than exposure duration. Further, it was found that luminance and exposure duration determined different RT functions in the 2 experiments. In the discrimination task there was a gradual shift in the relation of luminance and exposure duration to RT, from inverse at bright and long exposures, to direct at dim and brief exposures. In the detection task, RT was always inversely related to changes in luminance and exposure duration, to the extent to which RT was affected by these variables.

R 8

25,804

Williams, H.L., Kearney, Ometta F. & Lubin, A. SIGNAL UNCERTAINTY AND SLEEP LOSS. *J. exp. Psychol.*, April 1965, 69(4), 401-407. (University of Oklahoma School of Medicine, Norman, Okla.).

During a 3-5 day base-line period, 2 days of sleep loss, and 3 days of recovery, 52 Ss performed 3 visual vigilance tasks, of 10 min. each ranging in signal uncertainty from complete redundancy to .84 bit per sec. The major effect of uncertainty was to cause errors of omission which increased with sleep loss. The interaction between signal uncertainty and sleep loss was significant. Task duration (of 10 min.) caused no impairment during the base-line and recovery phases, but during sleep loss, errors of omission rose sharply on the last 3 min. of each task. There was no significant interaction between signal uncertainty and task duration. Decrement was considerably greater for Ss working alone than for Ss working in a group. Oral temperature had no consistent relation to errors of omission or to sleep loss.

R 19

25,805

Fitts, P.M. & Biederman, I. S-R COMPATIBILITY AND INFORMATION REDUCTION. *J. exp. Psychol.*, April 1965, 69(4), 408-412. (University of Michigan, Ann Arbor, Mich.).

S-R compatibility effects were examined in 4 information-processing tasks (1-bit information conserving, 2-bit conserving, 2 to 1 bit filtering, and 2 to 1 bit condensing) in combination with 2 sets of responses (2 or 4 fingers of 1 hand only vs 1 or 2 fingers of both hands). 8 different groups of 10 Ss each were used, 1 under each condition, and tested for 2 sessions. 1-bit conserving and 2 to 1 bit filtering were accomplished about equally well, under both response codes. The other 4 tasks involved significantly more time and errors. When a compatible (2-hand) response code was used, 2-bit information conserving was more efficient than 2 to 1 bit information condensing, notwithstanding the fact that the former involved twice as many alternative responses; these relations were reversed when a less compatible (1-hand) response code was used. These results indicate the importance of response coding in interpreting studies of different information-handling processes.

R 13

25,806

Emmerich, D.S., Goldenbaum, D.M., Hayden, D.L., Hoffman, Linda S., et al. MEANINGFULNESS AS A VARIABLE IN DICHOTIC HEARING. *J. exp. Psychol.*, April 1965, 69(4), 433-436. (Indiana University, Bloomington, Ind.).

It is suggested that the results reported by Broadbent (1954) concerning the difficulty of 2 different orders of report in a dichotic hearing situation might be due in part to the use of digits as stimuli rather than material of a more meaningful nature. An experiment was run using lists of 1-syllable words instead of digits in order to investigate this possibility, and results were obtained which were in disagreement with those of Broadbent. It was suggested that Broadbent's theory needs to be modified in order to take into account S's ability to make use of a relatively permanent memory system when material facilitating meaningful associations is used in the dichotic hearing situation.

R 3

25,807

Inada, G.J. & Hall, C.W. STATISTICAL OBSERVATIONS OF SURVIVORS OF THE HIROSHIMA A-BOMB. CLINICAL AND STATISTICAL OBSERVATIONS OF DELAYED EFFECTS. *Amer. J. Ophthalmol.*, Feb. 1965, 59(2), 216-221. (New York, N.Y.).

Studies made of survivors of the atomic bomb by various investigators have shown that heavily exposed survivors of either the Hiroshima or Nagasaki A-bombs have radiation cataracts. This study proposed to answer the question: could 1 of the effects of exposures to ionizing radiation be to increase the incidence of certain types of lenticular opacities? The 986 patients examined were drawn from the "master sample" determined and used by the programs of ABCC (Atomic Bomb Casualty Commission). 2 groups were compared: an irradiated (proximal exposed) group and a control (distal exposed) group. The latter group consisted of persons who were in the city of Hiroshima at the time of the explosion of the A-bomb but were so far distant from the hypocenter that they received only a negligible amount of ionizing radiation. The patients were presented to the ophthalmologist without his knowing whether they were of the experimental or control group. Very significant statistical test results indicate that lenticular opacities observed have definite relationship of ionizing radiation exposure distance from the hypocenter. Exposure to ionizing radiation does increase the incidence of lenticular changes indicative of ionizing radiation (definite opacities, polychrome posterior capsular roughening, excessive cortical opacities unexplained and, especially, the polychrome posterior capsular plaques). No appreciable differences in opacities by sex or loss of visual acuity were observed.

R 11

25,808

Weisbach, P.T. THE OPHTHALMOLOGIST'S ROLE IN THE MANAGEMENT OF DYSLEXIA. *Amer. J. Ophthalmol.*, Feb. 1965, 59(2), 265-271. (Beaumont, Tex.).

Dyslexia is a clinical entity characterized by subnormal reading ability in a person of average or above average intelligence. It is a disease which has different causes in different children. The causes include brain damage in the "language area", hereditary predisposition and such ophthalmic factors as hyperopia, muscle imbalance, aniseikonia or visual immaturity. Emotional disturbances, educational immaturity and cerebral dominance may also play some role in the etiology of this condition. These children should be recognized in their first year of school. A complete medical work-up should be managed by an ophthalmologist. A complete ophthalmic examination should first be performed and all possible visual anomalies should be corrected. The ophthalmologist may want a psychometric evaluation, a neurologic opinion to determine the role of organic brain damage, psychiatric consultation for evaluation of emotional disturbances, pediatric consultation for evaluation of the status of the general health and/or consultation by an otolaryngologist to determine the patient's hearing ability. With all the necessary information at hand, the ophthalmologist will be able to recommend corrective medical therapy and to advise the parents and teachers about available remedial reading aids.

R 10

25,809

Francois, J., Verriest, G. & DeRouck, A. A NEW PEDIGREE OF IDIOPATHIC CONGENITAL NIGHT-BLINDNESS. *Amer. J. Ophthalmol.*, April 1965, 59(4), 621-625. (Ophthalmological Clinic, University of Ghent, Ghent, Belgium).

A report is given of a study of 2 cases of typical idiopathic congenital night-blindness transmitted as a dominant hereditary trait. From the functional point of view, both cases examined showed a complete and selective deficiency of scotopic vision, psychophysically as well as electrophysiologically. It should also be noted that their photopic color discrimination was altered by a very mild deficiency with respect to the blue-yellow axis, which has been described often before in other cases of idiopathic night-blindness transmitted as a dominant hereditary characteristic. The dark-adaptation curve was distinctly higher than in the cases of Nougarian idiopathic nyctalopia studied with the same technique. Furthermore, the electro-oculographic study revealed that the physiologic decrease in the resting potential of the eyeball during adaptation to darkness may be present or absent.

R 7

25,810

Keppel, G. PROBLEMS OF METHOD IN THE STUDY OF SHORT-TERM MEMORY. *Psychol. Bull.*, Jan. 1965, 63(1), 1-13. (University of California, Berkeley, Calif.).

Consideration of design which have been problems in the study of long-term memory are discussed in the context of short-term memory research. These problems include the type of experimental design (independent versus repeated measures), the measurement of immediate retention, and the means by which the retention interval is filled. This review indicates that these methodological problems are also present in the investigation of short-term memory.

R 35

25,811

Uttal, W.R. DO COMPOUND EVOKED POTENTIALS REFLECT PSYCHOLOGICAL CODES? *Psychol. Bull.*, Dec. 1965, 64(6), 377-392. (University of Michigan, Ann Arbor, Mich.).

The purpose of this paper is to examine the question of the utility of the compound evoked potential as a sign of perceptual experience. A discussion is presented of the origin of the peripheral nerve compound action potential and the brain potential evoked by impulsive stimuli. Some of the recent literature on the potentials from human Ss is considered to determine what progress has been made in correlation these electrical signs with psychophysical responses. It is concluded that while certain suggestions have been forthcoming, both denying and affirming the relation, the evidence is still inconclusive that simple correspondences exist between the 2.

R 34

25,812

DeLamater, J., McClintock, C.G. & Becker, G. CONCEPTUAL ORIENTATIONS OF CONTEMPORARY SMALL GROUP THEORY. *Psychol. Bull.*, Dec. 1965, 64(6), 402-412. (University of Michigan, Ann Arbor, Mich.).

In an attempt to study some of the conceptual and content parameters of contemporary small group orientations, 2 classificatory systems were developed and applied to a sample of empirical hypotheses derived from 6 such orientations. The results of this analysis provide data on the similarities and differences between these points of view on 3 dimensions: a) the size of the social unit(s); b) the social process level(s) with which they deal; and c) the substantive content of the variables which they employ.

R 61

25,813

Taylor, I.K. & Taylor, M.M. ANOTHER LOOK AT PHONETIC SYMBOLISM. Psychol. Bull., Dec. 1965, 64(6), 413-427. (Lakeshore Psychiatric Hospital, New Toronto, Ontario, Canada & Defence Research Medical Labs., Toronto, Ontario, Canada).

Various possible meanings of "phonetic symbolism" are discussed. Phonetic symbolism is distinguished from onomatopoeia. "Elemental" and "structural" phonetic symbolism are defined. Elemental phonetic symbolism is discussed in terms of 7 hierarchically arranged questions which define "subjective" phonetic symbolism (that detected by observer) and "objective" phonetic symbolism (overrepresentation of particular sounds in words of particular connotations in natural languages). Experimental and empirical evidence relevant to each question are discussed, and it is concluded that both subjective and objective elemental phonetic symbolism are real phenomena, but that the patterns of symbolism are unrelated in historically unrelated languages. The feedback theory of phonetic symbolism (Taylor, 1963) is considered in greater detail than heretofore. The feedback theory asserts that if speakers of a language show subjective phonetic symbolism, then the language will come to show the same pattern of objective phonetic symbolism, and that the pattern of objective phonetic symbolism in the language similarly influences the development of subjective phonetic symbolism in the speakers.

R 31

25,814

Levin, J. THREE-MODE FACTOR ANALYSIS. Psychol. Bull., Dec. 1965, 64(6), 442-452. (University of Tel-Aviv, Tel-Aviv, Israel).

2 studies employing Tucker's 3-mode factor analysis are reported. The 1st is an analysis of semantic differential data. 4 scale factors and 4 concept factors were obtained. 1 subject-type was obtained. It consisted of a core matrix linking the scale factors to the concept factors. The 2nd study is an analysis of an S-R Inventory of Anxiousness. 3 situation factors and 3 response factors were obtained. Also, 3 types were obtained each consisting of a 3x3 matrix linking the response factors to the situation factors.

R 19

25,815

Restle, F. SIGNIFICANCE OF ALL-OR-NONE LEARNING. Psychol. Bull., Nov. 1965, 64(5), 313-325. (Indiana University, Bloomington, Ind.).

The essential characteristic of all-or-none data is that errors are recurrent events. Theoretical models having this property are derived from cognitive theory, Hullian theory, and stimulus-sampling theory. In addition, continuous-learning models, including the linear model and Luce's beta model, are shown to have all-or-none special cases. 3 experimental methods--the substitution method, the miniature experiment, and detailed distributional analysis of simple learning--have yielded information on conditions that give all-or-none data. Multiple-stage models, built of more than 1 all-or-none process, can be used to dissect a complex learning process into elementary parts.

R 48

25,816

Castellan, N.J., Jr. ON THE PARTITIONING OF CONTINGENCY TABLES. Psychol. Bull., Nov. 1965, 64(5), 330-338. (Indiana University, Bloomington, Ind.).

The chi-square test is presented in general. If a contingency table is greater than 2x2 the usual chi-square test of independence fails to determine the source of interaction if interaction is present. Methods for extending the chi-square analysis of  $r \times c$  contingency tables are presented. The procedures outlined consist of partitioning an  $r \times c$  contingency table into  $(r-1)(c-1)$  independent components, each with 1° of freedom. A special partition of a  $2 \times c$  table into 3 independent components is also given. The results of partitioning permit precise inference about independence or interaction in a contingency table and allow specific hypotheses to be tested without loss of generality.

R 13

25,817

Overall, J.E. & Dalal, S.N. DESIGN OF EXPERIMENTS TO MAXIMIZE POWER RELATIVE TO COST. Psychol. Bull., Nov. 1965, 64(5), 339-350. (Medical Branch, University of Texas, Austin, Tex.).

The relationship of power of F tests to expected mean squares,  $E(MS)$ , in the ANOVA is discussed. While components of variance in the  $E(MS)$  are largely a function of nature, the coefficients associated with them are matters of experimental design. Frequently a different cost is associated with each type of experimental unit represented by the different coefficients. It is possible to maximize power relative to cost by optimal allocation of available resources among various types of experimental units--for example, numbers of Ss, duplicate measures, replicates, etc. A simple index of relative power involving the ratio of the estimated F ratio to  $F_\alpha$  is proposed as useful in choosing the allocation of resources most likely to yield significant results.

R 11

25,818

Malmo, R.B. PHYSIOLOGICAL GRADIENTS AND BEHAVIOR. Psychol. Bull., Oct. 1965, 64(4), 225-234. (Allan Memorial Institute, McGill University, Montreal, Quebec, Canada).

Physiological gradients accompanying mental activity have been found in skeletal-motor and autonomic recordings, commencing with the onset of the behavior sequence and terminating at its conclusion. Experimental evidence is presented indicating that these gradients do not signify increasing activation (or arousal) during the behavioral sequence (e.g., task or period of attentive listening). On the contrary, the EEG evidence clearly indicates that cortical activity remains relatively constant during the sequence when skeletal-motor and cardio-respiratory levels show progressive rise. While the gradients therefore appear not to represent increasing motivation, or the like, during the task, there is strong evidence indicating that the steepness of the gradients is a function of motivational level.

R 36

25,819  
Hartlage, L.C. EFFECTS OF CHLORPROMAZINE ON LEARNING. Psychol. Bull., Oct. 1965, 64(4), 235-245. (Larue Carter Hospital, Indianapolis, Ind.).

Learning is an essential part of behavior therapies and is an important requirement of more traditional psychotherapy. The widespread use of tranquilizing drugs in psychiatric settings prompts a review of their effects on learning. Chlorpromazine is perhaps the most widely investigated tranquilizing drug and is used as a referent in the assessment of its effect on learning. Results of studies involving a number of animals, normal Ss, and psychiatric patients tend to show significant declines in learning on a wide range of tasks, with a linear decline in learning with increased dosage levels. A number of methodological difficulties which limit generalizations are discussed.

R 130

25,820  
Avant, L.L. VISION IN THE GANZFELD. Psychol. Bull., Oct. 1965, 64(4), 246-258. (Kansas State University, Manhattan, Kan.).

A summary of the evidence on exposure to structureless visual fields is presented. The data show the experience of such fields to be characterized by reports of: immersion in a "sea of light" which separates into figure and ground as brightness is increased, chromatic adaptation in colored fields, loss of efficiency in detecting the presence and movement of inhomogeneities introduced into the field, disorientation of the O, an increased and fluctuating state of accommodation, and the occasional joint occurrence of an apparent cessation of function of the visual mechanism and increased alpha activity in the brain.

R 40

25,821  
Miller, R.A., Meyer, S.W. & Mader, R. RESEARCH STUDY OF THE BIOMEDICAL ASPECTS OF AEROSPACE SYSTEMS ENVIRONMENTAL CHAMBER MARK I. PHASE V. STUDY OF MAN RATING SUBSYSTEM DESIGN CRITERIA. VOLUME II. Contract AF 40(600) 1012, Proj. 7778, AEDC TR 65 179, Aug. 1965, 51pp. USAF Arnold Engineering Development Center, Arnold AFB, Tenn. (Missile & Space Div., General Electric Company, King of Prussia, Penn.). (AD 465039)

This report presents design criteria that were evolved for certain specialized subsystems that are necessary to man rate the AEDC Mark I Aerospace Systems Environmental Chamber. Criteria were developed for the following subsystems: a) Remote Environmental Control Systems (ECS) to sustain full pressure suited men; b) ECS - to suit umbilicals (Preliminary); c) ECS/Biomedical Control Console; d) Rapid Repressurization Subsystem (Preliminary); and e) Biomedical Facilities Special Requirements. The depth and detail of the criteria evolved during this phase of the Mark I Man Rating were limited by available funding and tight schedule requirements.

R 2

25,822  
Ziller, R.C. TOWARD A THEORY OF OPEN AND CLOSED GROUPS. Psychol. Bull., Sept. 1965, 64(3), 164-182. (University of Delaware, Newark, Del.).

4 characteristics differentiate groups in which membership is in a constant state of flux (open groups) as opposed to groups in which the membership is relatively stable (closed groups): time perspective, equilibrium, frame of reference, and changing group membership. The significance of these characteristics for social behavior was explored. A number of tested and testable propositions concerning group stability and social behavior emerged from a rapprochement of research, relevant subtheories, and concepts associated with open- and closed-group behavior. The failure to consider the dimension of group stability in most previous social-psychological research poses a question concerning the generality of social-psychological theories which are based upon research which ignores the pervasive dimension of group stability.

R 71

25,823  
Lewis, M. PSYCHOLOGICAL EFFECT OF EFFORT. Psychol. Bull., Sept. 1965, 64(3), 183-190. (Fels Research Institute, Yellow Springs, Ohio).

The present review explores the psychological effect of effort. While the present problem has received little attention, the studies of effort can be divided into two major areas: a) Is effort an aversive stimulus, to be avoided in a choice situation and resulting in decrements in response strength? b) Can effort once expended affect the stimulus-event (reward) associated with that effort? The available literature does not provide any conclusive statements concerning the aversive effect of effort. However, effort does seem to enhance the value of a stimulus associated with the expenditure of effort.

25,824  
Bogartz, R.S. THE CRITERION METHOD: SOME ANALYSES AND REMARKS. Psychol. Bull., July 1965, 64(1), 1-14. (Institute of Child Behavior & Development, University of Iowa, Ames, Iowa).

The distribution of trials to criterion under the null hypothesis of no learning is obtained for 2 broad classes of criteria. Tables are provided which give the maximum permissible number of trials which may be run such that the probability of reaching criterion when learning does not occur remains less than a selected value. These results include Grant's analysis of the "runs" criterion as a special case. Illustrations of a number of problems which arise in the use of the criterion method also are presented to emphasize the often ignored dependence of method upon theory.

R 0

25,825  
Sprott, D.A. & Kalbfleisch, J.G. USE OF THE LIKELIHOOD FUNCTION IN INFERENCE. Psychol. Bull., July 1965, 64(1), 15-22. (University of Waterloo, Waterloo, Ontario, Canada).

The likelihood function is defined and its use illustrated by a simple coin-tossing experiment. The distinction between the use of the likelihood function and the use of a test of significance is emphasized and illustrated by a simple genetics example. Some examples are given of experiments in psychology where the likelihood function is used to analyse the resulting data; the relative merits of the use of likelihood compared to other more standard methods of analysis are discussed.

R 13

25,826

Porter, L.W. & Lawler, E.E., III. PROPERTIES OF ORGANIZATION STRUCTURE IN RELATION TO JOB ATTITUDES AND JOB BEHAVIOR. Psychol. Bull., July 1965, 64(1), 23-51. (University of California, Berkeley, Calif. & Yale University, New Haven, Conn.).

This article reviews the results of empirical field studies that have investigated the relationships between properties of organization structure and job attitudes and job behavior in business and industrial organizations. The following 7 structural properties were examined: organizational levels, line/staff hierarchies, span of control, subunit size, total-organization size, tall/flat shape, and centralized/decentralized shape. At least 5 of these 7 variables (with the possible exceptions being span of control and centralized/decentralized shape) were found to be significantly related to one or more attitude or behavioral variables. Implications of these findings for organization theory and future research are discussed.

R 108

25,827

Hudspeth, W.J. & Gerbrandt, L.K. ELECTROCONVULSIVE SHOCK: CONFLICT, COMPETITION, CONSOLIDATION, NEUROANATOMICAL FUNCTIONS. Psychol. Bull., June 1965, 63(6), 377-383. (Claremont Graduate School, Claremont, Calif.).

Recent studies supporting conflicting interpretations of ECS effects were reviewed and related to limbic system seizure proneness, neuroanatomical response specificities, and the electrophysiological correlates of conditioning. The effects of ECS, viewed against such a perspective, appeared to be quite consistent, even though several nonunifying hypotheses are extant.

R 47

25,828

Tuckman, B.W. DEVELOPMENTAL SEQUENCE IN SMALL GROUPS. Psychol. Bull., June 1965, 63(6), 384-399. (USN Medical Research Institute, Bethesda, Md.).

50 articles dealing with stages of group development over time are separated by group setting, as follows: therapy-group studies, T-group studies, and natural- and laboratory-group studies. The stages identified in these articles are separated into those descriptive of social or interpersonal group activities and those descriptive of group-task activities. Finally, 4 general stages of development are proposed, and the review consists of fitting the stages identified in the literature to those proposed. In the social realm, these stages in the developmental sequence are testing-dependence, conflict, cohesion, and functional roles. In the task realm, they are orientation, emotionality, relevant opinion exchange, and the emergence of solutions. There is a good fit between observed stages and the proposed model. Further study of temporal change as a dependent variable is suggested.

R 62

25,829

Edwards, W. TACTICAL NOTE ON THE RELATION BETWEEN SCIENTIFIC AND STATISTICAL HYPOTHESES. Psychol. Bull., June 1965, 63(6), 400-402. (Engineering Psychology Lab., University of Michigan, Ann Arbor, Mich.).

Grant, Binder, and others have debated what should be the appropriate relationship between the scientific hypotheses that a scientist is interested in and the customary procedures of classical statistical inference. Classical significance tests are violently biased against the null hypothesis. A conservative theorist will therefore associate his theory with the null hypothesis, while an enthusiast will not--and they may often reach conflicting conclusions, whether or not the theory is correct. No procedure can satisfactorily test the goodness of fit of a single model to data. The remedy is to compare the fit of several models to the same data. Such procedures do not compare null with alternative hypotheses, and so are in this respect unbiased.

R 9

25,830

Wallace, W.P. REVIEW OF THE HISTORICAL, EMPIRICAL, AND THEORETICAL STATUS OF THE VON RESTORFF PHENOMENON. Psychol. Bull., June 1965, 63(6), 410-424. (Northwestern University, Evanston, Ill.).

The major purpose of the review was to examine theoretical and empirical properties of the von Restorff phenomenon. A selection of studies that preceded the von Restorff article demonstrated that isolating an item by making it more vivid than the rest of the list yielded a positive influence on learning that item. Subsequent studies in a variety of contexts have been quite consistent in confirming that isolation facilitates learning of the isolated item. The present review attempts to indicate some of the specific features and influences of the von Restorff effect. The final section of the article presents theoretical discussions and suggested attempts to explain the isolation effect.

R 68

25,831

Frey, A.J. BEHAVIORAL BIOPHYSICS. Psychol. Bull., May 1965, 63(5), 322-337. (Institute for Research, State College, Penn.).

Electromagnetic energy is an important factor in the biophysical analysis of the properties and function of living systems. Due to technical advances in electronics, this energy is now being used as a research tool, both by study of its emission by living organisms and also by applying it to the organism. In this paper, the nature of the energy is sketched. Then, data on fingertip detection of color, neural emission of infrared energy, the use of electron paramagnetic resonance techniques to detect neural activity, brain impedance shifts and behavior, and the influence of UHF energy on behavior are considered. It is concluded that, though these areas are in the embryonic stage of development, most are potentially of great significance in the understanding of the nervous system and behavior.

R 77

25,832

McLaughlin, B. "INTENTIONAL" AND "INCIDENTAL" LEARNING IN HUMAN SUBJECTS: THE ROLE OF INSTRUCTIONS TO LEARN AND MOTIVATION. *Psychol. Bull.*, May 1965, 63(5), 359-376. (Harvard University, Cambridge, Mass.).

This paper reviews research on the phenomenon of incidental (INC) learning with particular attention to differences in degree between the functional relations pertaining to INC and intentional (INT) learning. The nature of orienting instructions and resultant differential cue-producing responses are seen to be critical to the study of INC learning. The importance of studies dealing with properties of stimulus items is stressed and the differential cue-producing hypothesis examined in the light of research involving variations in motivational level. It is suggested that this conceptualization be extended to include theoretical formulations based on cue utilization as a function of motivation. Defining operational procedures are criticized for providing no clear distinction between INT and INC learning.

R 107

25,833

Kintz, B.L., Delprato, D.J., Mettee, D.R., Persons, C.E., et al. THE EXPERIMENTER EFFECT. *Psychol. Bull.*, April 1965, 62(4), 223-232. (Ohio University, Athens, Ohio).

Recent investigations in experimental psychology have shown somewhat striking results which indicate that Es may and do influence their data. This problem was considered in relation to the areas of: experimental, counseling, and testing psychology. A historical review revealed that although the influence of E has been generally acknowledged, an unconcerned attitude towards this phenomenon has been taken, especially by experimental psychologists. Counseling psychology has been most concerned with the E effect because this is closely related to the counseling situation. Workers in this area have not only recognized but have attempted to manipulate E influence. In the field of testing, investigators have reported significant variability in Ss' performances as a result of E characteristics.

R 43

25,834

Tellegen, A. DIRECTION OF MEASUREMENT: A SOURCE OF MISINTERPRETATION. *Psychol. Bull.*, April 1965, 63(4), 233-243. (University of Minnesota, Minneapolis, Minn.).

Interpretation of psychological measures is sometimes based on relationships between test characteristics (factor loadings, proportion of items keyed True, etc.) The direction of measurement adopted for a scale often determines how test characteristics are recorded. Failure to regulate direction of measurement, called here direction error, produces misleading results by affecting the distribution and intercorrelations of test characteristics. Examples are drawn from criterion analysis, the study of acquiescence, social desirability, and communality. A method for regulating direction of measurement is discussed. Its rationale is based on a distinction between directional and differential measurement.

R 34

25,835

Dominowski, R.L. ROLE OF MEMORY IN CONCEPT LEARNING. *Psychol. Bull.*, April 1965, 63(4), 271-280. (DePaul University, Chicago, Ill.).

Studies manipulating variables in the attempt to produce different memory requirement in concept learning are reviewed. Many of them have tested Underwood's theoretical position of response contiguity. Performance is generally improved by increasing the availability of previous stimulus information. The degree to which instances of the same concept occur contiguously directly affects acquisition of the concept. Attempts to demonstrate inferior performance with spaced practice have not been successful, although procedural problems make any conclusion tentative. There is some suggestion that memory effects could be classified as proactive and retroactive inhibition. A basic problem concerns the indirect type of question posed by investigators.

R 36

25,836

Rorer, L.G. THE GREAT RESPONSE-STYLE MYTH. *Psychol. Bull.*, March 1965, 63(3), 129-156. (Oregon Research Institute, Eugene, Ore.).

Response styles (e.g., "yeasaying") must be distinguished from response sets (e.g., "disimulation"). When this is done, and when those designs which permit inferences concerning response styles are distinguished from those which do not, the data accumulated to date must be interpreted as indicating that response styles are of no more than trivial importance in determining responses to personality, interest, and attitude inventories, current opinion to the contrary notwithstanding.

R 180

25,837

Heckmuller, E.G. STABILIZATION OF THE RETINAL IMAGE: A REVIEW OF METHOD, EFFECTS AND THEORY. *Psychol. Bull.*, March 1965, 63(3), 157-169. (University of Cincinnati, Cincinnati, Ohio).

A summary is presented of 3 basic methods used in reducing or stopping involuntary eye movements in order to produce a stable retinal image. This stabilization produces some degree of fading or disappearance of the target being viewed. Additional effects on such factors as acuity and contrast thresholds are considered, as well as the effects of such variables as exposure time, flicker, attention, meaning, and target complexity on the nature and extent of target disappearance. Some explanations for the phenomenon are presented, and the theoretical implications of invariant stimulation on the perceptual process are discussed.

R 39

25,838

Bever, T.G., Fodor, J.A. & Wexsel, W. IS LINGUISTICS EMPIRICAL? *Psychol. Rev.*, Nov. 1965, 72(6), 493-500. (Massachusetts Institute of Technology, Cambridge, Mass.).

This paper continues the discussion of issues raised by Braine's theory of "contextual generalization." The arguments for analyzing the English declarative as transformationally generated are discussed at length. Broader issues about the nature of confirmation of claims made by grammars are also considered. It is argued that while the direct experimental verification of such claims is often not feasible, considerations of simplicity and generality can provide adequate grounds for their empirical confirmation or disconfirmation.

R 5

25,839

Tufts University. PROCEEDINGS OF THE FIRST NEW ENGLAND CONFERENCE ON URBAN PLANNING FOR ENVIRONMENTAL HEALTH. Sept. 1965, 318pp. Tufts University, Medford, Mass.

This Conference was designed to bring together all agencies, institutions, and individuals interested, or participating, in programs having a bearing on planning for a modern, clean and safe environment for the heavily populated areas of New England. The latest information available dealing with environmental health planning, including detailed discussions of the hygiene of housing, public water supply, sewage disposal, refuse collection and disposal, air pollution, recreation facilities and noise control were presented.

R Many

25,840

Morse, R.L. A DATA PROCESSING SYSTEM FOR THE BALLISTOCARDIOGRAM. BuMed Proj. MR005.13 7004, Subtask 6, NSAM 915, Rep. 12, Feb. 1965, 48pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (AD 620252)

Operation of a mathematical model of the ballistocardiogram by digital computer and other data processing facilities provides an estimate of arterial elasticity, pulse wave velocity, intra-arterial pulse wave form, and correct ordinates of the acceleration, velocity, and displacement ballistocardiogram.

R 7

25,841

University of Pittsburgh Army Materiel Research Staff. DEVELOPMENT OF EJECTION SEAT MAINTENANCE TRAINER FOR OV-1 AIRCRAFT, DEVICE 9E1. Contract DA 49 186 AMC 214(D), TIR 33.3.4.1, July 1965, 3pp. University of Pittsburgh Army Materiel Research Staff, Washington, D.C. (AD 468732)

The ejection seat maintenance trainer is used to teach Army aviation mechanics maintenance of the Martin-Baker ejection seat in the OV-1 Mohawk high-performance aircraft. The trainer is a modified operational ejection seat supported by a framework to simulate its position in the aircraft. The classroom training is highly realistic, since every aspect of the ejection seat mechanism can be studied in action and in detail by the trainees.

25,842

Levison, P.K., Findley, J.D. & Ferster, C.B. DRUG EFFECTS IN COMPLEX REPERTOIRES IN MONKEYS, BABOONS AND MAN. Contract DA 1 108 AMC 26 A CP3 4025, Rep. 5, July 1965, 18pp. Institute for Behavioral Research. (AD 468512)

The work described in this report is part of an ongoing effort to develop behavioral performance in lower primates and man which will be useful for the analysis of complex behavior and lead to the assessment of drug effects in complex repertoires. The methods employed in this task include the procedures and equipment developed in recent years in the experimental analysis of behavior. A new matching-to-sample problem-solving procedure was developed with human Ss at the Institute and used with CRDL volunteer drug Ss in a mobile laboratory at Edgewood Arsenal. The procedure involves recognition of similarities and differences in visually-presented sets of symbols, with experimental manipulation of stimulus presentation durations, inter-stimulus delay periods, and schedules of reinforcement. The mobile laboratory and an experimental chamber containing several optional activities in addition to matching-to-sample are described in detail. Preliminary results indicate the operational feasibility of both experimental settings. 1 drug effect has been detected, a depression of rate of problem-solving under secobarbital. A problem in drug assessment is the continuing improvement of accuracy over several hrs., which tends to obscure threshold drug effects in the relatively brief sessions at CRDL.

R 5

25,843

Michels, K.M. & Zusne, L. METRICS OF VISUAL FORM. Psychol. Bull., Feb. 1965, 63(2), 74-86. (Florida Atlantic University, Boca Raton, Fla. & University of Tulsa, Tulsa, Okla.).

A review of research work relating perceptual response to physical form parameters. The parameters are classified into transitive, transpositional, and intransitive. The number of intransitive parameters, which comprise measures that specify the characteristics of shape contours proper and contain the bulk of all physical measures, is quite large, but only very recent work has begun to point to the existence of a common denominator of these measures and to the possibility of arriving at a limited set of related and homogeneous parameters based on both empirical evidence and a priori mathematical considerations.

R 64

25,844

Zavala, A. DEVELOPMENT OF THE FORCED-CHOICE RATING SCALE TECHNIQUE. Psychol. Bull., Feb. 1965, 63(2), 117-124. (American Institutes for Research, Washington, D.C.).

Forced-choice (FC) rating scales came about because of dissatisfaction with conventional scales. Reliabilities and validities of FC methods compare favorably with other methods. Studies on the FC method show this scale is more resistant than other scales to effects of bias. Formats using 4 favorable items, from which the rater chooses the items most characteristic of the person rated, prove superior to other formats. This superiority appears in validities, reliabilities, and preferences of raters using the form. Conditions under which statement indices are obtained should be as similar as possible to conditions under which the final scale will be administered. Combining FC scores with other scale scores yields better results than using either instrument alone. Ample evidence exists that more research can fruitfully be done in the area.

R 54

25,845

Gaito, J. UNEQUAL INTERVALS AND UNEQUAL n IN TREND ANALYSES. Psychol. Bull., Feb. 1965, 63(2), 125-127. (York University, Toronto, Ontario, Canada).

The method of deriving orthogonal coefficients for the general case of unequal n and unequal intervals between points of the quantitative independent variable is demonstrated. A drug study is worked through as an example. (HEIAS)

R 54

25,846

Parducci, A. CATEGORY JUDGMENT: A RANGE-FREQUENCY MODEL. Psychol. Rev., Nov. 1965, 72(6), 407-418. (University of California, Los Angeles, Calif.).

The range-frequency theory is concerned with category judgments, like "good" and "bad," or "large," "medium," and "small." A specific model derives the judgments from 2 basic assumptions: a) The judge divides his psychological range into subranges whose relative sizes are independent of the stimulus conditions; and b) he employs the alternative categories with equal frequency. The model uses judgments obtained when stimuli are presented with equal frequency to predict the judgments when stimuli are presented with unequal frequencies. These data are also used to evaluate the weight-mean model for adaptation level. It is concluded that category judgments are more adequately explained by the range-frequency theory than by the theory of adaptation level.

R 10

25,847

Harris, C.S. PERCEPTUAL ADAPTATION TO INVERTED, REVERSED, AND DISPLACED VISION. Psychol. Rev., Nov. 1965, 72(6), 419-444. (University of Pennsylvania, Philadelphia, Penn.).

Recent research has shown that a simple form of adaptation to prism-produced displacement of the visual field consists primarily of a proprioceptive change—a change in the felt position of the arm seen through prisms—rather than a visual, motor, or visuomotor change. More complex sorts of adaptation (to inversion, reversal, and other optical transformations) can also be understood as resulting from changes in the felt locations of parts of the body relative to other parts. Contrary to the usual empiricist assumption, vision seems to be very stable, whereas the position sense is remarkably flexible. When the 2 senses provide discrepant information, it is the position sense that changes.

R 74

25,848

Freeman, R.B., Jr. ECOLOGICAL OPTICS AND VISUAL SLANT. Psychol. Rev., Nov. 1965, 72(6), 501-504. (Pennsylvania State University, University Park, Penn.).

Flock's "A Possible Optical Basis for Monocular Slant Perception" is criticized as being a theory of stimuli rather than a theory of perception. To account for accurate monocular slant perception, the theory requires 9 assumptions, including the unproved ability of the eye to register random texture density. The alternative hypothesis is proposed that monocular visual slant is a function primarily of contour perspective which varies with the size, shape, and viewing distance, as well as slant, of plane surfaces.

R 13

25,849

Flock, H.R. OPTICAL TEXTURE AND LINEAR PERSPECTIVE AS STIMULI FOR SLANT PERCEPTION. Psychol. Rev., Nov. 1965, 72(6), 505-514. (Dartmouth College, Hanover, N.H.).

Experiments critical of the effectiveness of variables of optical texture in evoking accurate judgments of slant are shown to be inappropriate, inadequate, or deficient. Experiments supporting linear perspective as a stimulus for slant are evaluated. The contention that perceived slant is a function primarily of linear perspective is shown to be oversimplified and hardly adequate to cope with the facts. Some aspects of Flock's theoretical model specifying optical stimuli for slant are discussed.

R 24

25,850

Scott, T.R. & Nolan, J.H. SOME STIMULUS DIMENSIONS OF ROTATING SPIRALS. Psychol. Rev., Sept. 1965, 72(5), 344-357. (US Veterans Administration Hospital, Columbia, S.C. & University of South Carolina, Columbia, S.C.).

The perceptible motion of rotating spiral lines can be analyzed into 3 components: motion normal to the line, rotational motion, and radial motion. General equations for these 3 components have been derived. Specific formulas for finding the 3 components for Archimedes, logarithmic, and hyperbolic spirals have been given in terms of distance from the center, speed of rotation, and the constants associated with these spirals. In addition, 3 "special" spirals have been derived which have, respectively, the properties that the normal, radial, and rotational motions are constant for all distances from the center of rotation greater than a minimum distance. Possible applications have been suggested.

R 23

25,851

Festinger, L. & Canon, L.K. INFORMATION ABOUT SPATIAL LOCATION BASED ON KNOWLEDGE ABOUT EFFERENCE. Psychol. Rev., Sept. 1965, 72(5), 373-384. (Stanford University, Stanford, Calif.).

An experiment was designed to determine whether or not the human organism possessed "outflow" information derived from monitoring nerve impulses in motor pathways. The experiment focused on the extraocular muscles since proprioceptive input to the central nervous system from these muscles is poor. The results show that in the absence of good proprioceptive information, the presence or absence of "outflow" information makes a difference in accuracy of localizing an object in space.



25,852

Foa, U.G. NEW DEVELOPMENTS IN FACET DESIGN AND ANALYSIS. *Psychol. Rev.*, July 1965, 72(4), 262-274. (Israel Institute of Applied Social Research, Jerusalem, Israel).

In multivariate research design the systematic definition of the set of variables in terms of more basic sets, the facets, leads to the predicting of the empirical interrelationship among the variables. 2 principles are suggested for prediction the results from the facet structure of the variables: the principle of contiguity and the semantic principal components. The principle of contiguity simply states that variables more similar in their facet structure will also be more related empirically. This principle does not provide for a differentiation among facets in determining the relationship. A nonparametric approach to the differentiation problem is provided by the more general concept of semantic principal component. The principle of contiguity turns out to be the special case of the first principal component. The application of these concepts to a number of studies in different behavioral areas suggests that they have predictive power. It is further shown that facet elements can be classified into specific and nonspecific to the set of variables and that variables containing specific elements tend to be related to the set of variables more than variables containing nonspecific elements. Systematic design alone does not guarantee correct prediction of empirical results. In fact, for a given area of behavior several alternative formalizations appear possible, and they will usually lead to different hypotheses. While the choice of a given facet design rather than another may depend on the intuition of the investigator, it appears also to be related to the psychology of concept formation and to the influence of language on this process.

R 19

25,853

Lane, H. THE MOTOR THEORY OF SPEECH PERCEPTION: A CRITICAL REVIEW. *Psychol. Rev.*, July 1965, 72(4), 275-309. (Language & Language Behavior Research Center, University of Michigan, Ann Arbor, Mich.).

The motor theory of speech perception maintains that articulatory movements and their sensory feedback mediate between the acoustic stimulus and the perception of speech. The theory is based on examination of changes in identification probability, identification latency, and discrimination accuracy effected by changes in synthetic speech stimuli. This paper reviews first those experiments cited in support of the theory, then opposing evidence is presented: It is shown that identification and discrimination functions for nonspeech stimuli do not differ from those for speech stimuli, when obtained under comparable conditions.

R 60

25,854

Jones, F.P. METHOD FOR CHANGING STEREOTYPED RESPONSE PATTERNS BY THE INHIBITION OF CERTAIN POSTURAL SETS. *Psychol. Rev.*, May 1965, 72(3), 196-214. (Institute for Psychological Research, Tufts University, Medford, Mass.).

An empirical method is described for changing habitual response patterns by inhibiting postural sets which disturb the reflex balance of the head. The procedure results in a redistribution of postural tonus which is reported by the subject as a decrease in the feeling of weight and in the effort needed to move. Differences in posture and movement are recorded by multiple-image photography, X-ray photography, and electromyography. Anatomical and physiological mechanisms are suggested to explain the phenomenon. The implications for behavioral science are discussed.

R 61

25,855

Lewis, D.J. & Maher, B.A. NEURAL CONSOLIDATION AND ELECTROCONVULSIVE SHOCK. *Psychol. Rev.*, May 1965, 72(3), 225-239. (Rutgers University, New Brunswick, N.J. & University of Wisconsin, Madison, Wisc.).

It is believed by many that the neural engram undergoes a consolidated phase after a learning trial. During this phase the engram is particularly susceptible to disruption by traumatic incidents. A review of the literature on electroconvulsive shock (ECS) provides little, if any, support for this point of view. ECS does, however, result in retrograde amnesia (RA). If the RA is not due to disruption of a consolidation process, then what are its sources? The writers interpret the literature to mean the ECS produces an inhibition of the Pavlovian variety which follows the known laws of learning and becomes conditioned to stimuli of the ECS situation. This point of view is shown adequate to explain much of the data produced by ECS studies and is consistent with other interpretations of the effects of massive stimulus discharges.

R 43

25,856

Zwicker, E. & Scharf, B. A MODEL OF LOUDNESS SUMMATION. *Psychol. Rev.*, Jan. 1965, 72(1), 3-26. (Technische Hochschule Stuttgart, Stuttgart-Nord, Germany & Northeastern University, Boston, Mass.).

A psychophysical model is presented that explains why loudness summates across frequency as it does and that permits the precise calculation of loudness from the physical spectrum. Loudness is represented by geometrical patterns derived from the masking of pure tones by narrow bands of noise. The masking patterns are converted to loudness patterns by means of the critical-band function that relates tonalness in Barks to loudness patterns by means of a power function that relates specific loudness, loudness per frequency in cycles per second level (SPL). Plotted on the coordinates of specific loudness and tonalness, the geometrical patterns are integrated to yield a value in sones for the overall loudness. Calculated values are compared to experimental values obtained from loudness balances with 3 types of sound.

R 39

25,857

Bahrck, H.P. THE EBB OF RETENTION. *Psychol. Rev.*, Jan. 1965, 72(1), 60-73. (Ohio Wesleyan University, Delaware, Ohio).

Retention curves based upon conventional techniques of representation are shown to be of limited usefulness because they confound the measurement of decay of memory traces with the effects of several other variables. The additional variables arise from the relations among the threshold of recall or recognition, and the mean, variance, and shape of the distribution of associative strength. A new method of representing the retention process is proposed. According to this method, estimates of changes in the position of the mean of the distribution of associative strength are plotted in units of variance called "ebbs." The assumptions underlying the use of ebbs are examined and evidence regarding the validity of the assumptions is presented.

R 10

25,858

Waugh, Nancy C. & Norman, D.A. PRIMARY MEMORY. *Psychol. Rev.*, March 1965, 72(2), 89-104. (Harvard Medical School, Boston, Mass. & Cognitive Studies Center, Harvard University, Cambridge, Mass.).

A model for short-term memory is described and evaluated. A variety of experimental data are shown to be consistent with the following statements: a) unrehearsed verbal stimuli tend to be quickly forgotten because they are interfered with by later items in a series and not because their traces decay in time; b) rehearsal may transfer an item from a very limited primary memory store to a larger and more stable secondary store; c) a recently perceived item may be retained in both stores at the same time. The properties of these 2 independent memory systems can be separated by experimental and analytic methods.

R 30

25,859

Day, R.H. & Power, R.P. APPARENT REVERSAL (OSCILLATION) OF ROTARY MOTION IN DEPTH: AN INVESTIGATION AND A GENERAL THEORY. *Psychol. Rev.*, March 1965, 72(2), 117-127. (Monash University, Clayton, Victoria, Australia).

3 explanations of apparent reversals (oscillation) of rotary motion in depth attribute this effect to misjudgment of orientation. These explanations are based mainly on observations of a trapezoidal 'window' in rotation. The experiments reported here show that perspective effects in a trapezoidal window do not increase reversal frequencies and that other shapes in addition to a trapezoid exhibit the effect with similar frequencies. The experiments also failed to confirm that misjudgments of orientation are a causal condition of apparent reversals. A general theory in terms of an identity of projected (retinal) motion characteristics for clockwise and anticlockwise motion is proposed with supporting evidence. Apparent orientation is held to be a consequence of rather than a necessary condition for apparent reversal. This theory is sufficiently general to explain apparent reversals ('fluctuations') in the orientation in depth of static figures and objects and to explain also the kinetic depth effect. All these phenomena are held to derive from an identity of retinal projections for 2 or more motions or orientations of an object in space.

R 17

25,860

Taylor, J.G. THE BEHAVIOURAL BASIS OF PERCEIVED SIZE AND DISTANCE. *Canad. J. Psychol.*, March 1965, 19(1), 1-14. (Defence Research Medical Labs., Toronto, Ontario, Canada).

It is suggested that perceived distance is a function of behaviour that is quantitatively adjusted to the distances of objects. This behaviour is conditioned to compound stimuli whose components include changes of stimulation due to movement. If some of the cues, and particularly those that depend on movement, are eliminated experimentally, there is a quantitative decrease in the behaviour that tends to be evoked, with a consequent shrinkage in perceived distance. This accounts for the common finding that perceived distance is a negatively accelerated increasing function of distance. Perceived size is a function of behaviour quantitatively adjusted to the dimensions of objects. If this behaviour can be evoked by objects at a distance we get size constancy. In this case the cues include those that are conditioned to distance responses, and the result is size-distance invariance. This invariance is disrupted by cue reduction. For example, elimination of distance cues dependent on motion results in increasing overestimation of size as distance increases. 2 size illusions are explained in terms of the theory.

R 15

25,861

Donderi, D.C. & Kane, Eleanor. PERCEPTUAL LEARNING PRODUCED BY COMMON RESPONSES TO DIFFERENT STIMULI. *Canad. J. Psychol.*, March 1965, 19(1), 15-30. (McGill University, Montreal, Quebec, Canada).

The effect of perceptual learning on disappearances of stimuli on a plain background was investigated. 4 experiments are reported. Common responses learned for 2 elements of a 3-element stimulus made the common-response elements disappear and remain visible together more frequently than any other pair. Recognition training had the same effect. The phenomenon was demonstrated with 3 luminous circles differing in diameter, 3 black radial lines on a white background, and 3 colored circles on a white background. Overlearning was necessary to produce the effect. The results support Hebb's association theory of perceptual learning.

R 10

25,862

Teghtsoonian, R. THE INFLUENCE OF NUMBER OF ALTERNATIVES ON LEARNING AND PERFORMANCE IN A RECOGNITION TASK. *Canad. J. Psychol.*, March 1965, 19(1), 31-41. (Smith College, Northampton, Mass.).

A task was devised requiring Ss to learn to recognize 16 3-digit numbers. Exp. I investigated the effect of number of alternatives per item on the difficulty of a recognition learning task. Each of the 16 sets of n 3-digit numbers was typed on a file card. From each set of alternatives, 1 3-digit number was randomly selected as the correct item, and the number was typed alone on a file card and inserted in the deck immediately after the card bearing the set of alternatives from which it was drawn. 64 Ss, in groups of 16 were given a deck of cards and its construction was described to them. They were told to look at each set of alternatives, to try to guess the identity of the correct item, and to write down their guess before looking at the next card which displayed the right answer. They were to proceed at their own pace until able to go through an entire trial with out making an error. Exp. II was conducted in an attempt to evaluate the status of the number of alternatives per item as a variable. The number of items to be learned was reduced from 16 to 12. The number of trials to criterion was found to increase with the number of alternatives per item; this relation was strongest for experimentally naive Ss. On the assumption of a distinction between learning and performance, the latter was shown in Exp. II to be influenced by the number of alternatives. This was interpreted as an effect on perceptual processes; the effect on mnemonic processes remained in doubt.

R 15

25,863

Hershenson, M. & Haber, R.N. THE ROLE OF MEANING IN THE PERCEPTION OF BRIEFLY EXPOSED WORDS. Canad. J. Psychol., March 1965, 19(1), 42-46. (University of Wisconsin, Madison, Wisc. & University of Rochester, Rochester, N.Y.).

10 Ss were repeatedly shown brief exposures of English and Turkish words at 3 different fixed durations. The stimuli were 144 English words randomly selected from 504 which represented the population 7-letter, 3-syllable words that appear not infrequently in print. In addition, each S was shown 144 7-letter, 3-syllable (if pronounced in English) Turkish words. Each word was assigned to 1 of 24 duration-by-trial combinations: 3 duration values (20, 25, or 30 msec.) and 8 trial numbers (1, 2, 3, 4, 5, 10, 15, 25) representing the number of times it would be flashed. A significant effect of repeated exposures was found in both languages ( $p < .001$ ) indicating that this effect does not depend upon meaning. English words were easier to perceive than Turkish words at each duration which suggests that meaning does play a role in perception and may contribute to 2 antagonistic effects.

R 5

25,864

Foley, P.J. & Stager, P. THE PHASE DIFFERENCE FUNCTION IN BINOCULAR FLICKER. Canad. J. Psychol., March 1965, 19(1), 47-55. (Defence Research Medical Labs., Toronto, Ontario, Canada & Psychology Dept., Princeton University, Princeton, N.J.).

2 experiments were carried out to determine the functional relation between the critical flicker frequency (cff) of 2 identical intermittent targets, binocularly superimposed, and the phase difference between the targets. 10 Ss, trained in making monocular cff determinations were used. The S was given 10 min. rest. The experimental procedure under each condition was as follows: a) a frequency was chosen at which the intermittent light appeared to be steady; b) the frequency was then decreased automatically, at a rate of 0.1 cps/sec., until the S reported just noticeable flicker; c) the frequency was then increased until the light appeared steady again, and a second determination made in the same way. 5 such readings were taken in succession. In Exp. I target size was kept constant at a diameter of 0.5°. 5 phase differences were used, from 0° to 180° in 45° steps. In Exp. II the phase differences investigated were from 180° to 360° in 45° steps. Binocular cff is a monotonic decreasing function of phase difference, positively accelerated for phase differences between 0° & 180°, and negatively accelerated for phase differences between 360° & 180°. It is postulated that the results can be accounted for by assuming the existence of something akin to the "isodynamic" cells of Cajal, and that more weight is attached to the input to these cells from 1 eye than from the other.

R 9

25,865

Pylyshyn, Z.W. THE EFFECT OF A BRIEF INTERPOLATED TASK ON SHORT-TERM RETENTION. Canad. J. Psychol., Dec. 1965, 19(4), 280-287. (University of Saskatchewan, Saskatoon, Saskatchewan, Canada).

This study was directed at demonstrating the effect of temporal location of a brief interpolated task on the recall of visually presented letters. A number of previously omitted controls were introduced. These included using an interpolated task (choice reaction time) which was very brief and quite different from the recall task, maintaining a constant expectancy of an interpolated task even for the control condition in which no interpolated task occurred, and varying the difficulty of both the recall and the interpolated task. The results showed that the largest drop in the recall score occurred when the interpolated task was presented soon after presentation of the stimulus to be recalled. The decrement in recall performance was not very great when compared with the recall when there was no interpolated activity. This differs from previously reported results and suggests that expectancy has an interfering effect.

R 11

25,866

Mackworth, Jane F. PRESENTATION RATE, REPETITION, AND ORGANIZATION IN AUDITORY SHORT-TERM MEMORY. Canad. J. Psychol., Dec. 1965, 19(4), 304-315. (Defence Research Medical Labs., Toronto, Ontario, Canada).

4 auditory experiments are described which study the effect of repetition on immediate recall of series of letters or digits. The variables investigated were presentation rate, message length, and organization. Recall from slow presentation differed from fast in nearly all cases, but the differences were complex. With rhythmic presentation, recall was better at the faster presentation rate but showed relatively little improvement with repetition, while there was greater loss of recall with the fast presentation when the message length increased. With non-rhythmic presentation, recall from the fast single presentation was less but greater improvement with repetition was noted. These results are discussed in terms of the decay theory.

R 8

25,867

Murray, D.J. THE EFFECT OF WHITE NOISE UPON THE RECALL OF VOCALIZED LISTS. Canad. J. Psychol., Dec. 1965, 19(4), 333-345. (Queen's University, Kingston, Ontario, Canada).

60 Ss either silently read, mouthed, whispered, soft-voiced, or loud-voiced lists of 8 consonants for immediate free recall. White noise of an intensity sufficient to mask S's hearing of his own soft voice (as far as possible) was present during presentation and/or recall. The results showed that when there was no noise at presentation, recall increased as vocalization activity increased; when there was noise throughout presentation and recall, loud voicing was significantly superior to whispering; when the noise was switched off for recall, loud voicing gave insignificantly inferior recall to soft voicing and whispering. The results are interpreted as being consistent with the view that when lists are vocalized Ss try to attend particularly to the auditory feedback, but that if this is prevented, more attention is paid to the motor cue. Presentation rate was not found to play a significant role in this experiment.

R 23

25,868

Mackworth, Jane F. THE EFFECT OF AMPHETAMINE ON THE DETECTABILITY OF SIGNALS IN A VIGILANCE TASK. Canad. J. Psychol., June 1965, 19(2), 104-110. (Defence Research Medical Labs., Toronto, Ontario, Canada).

10 mg. of d1-amphetamine sulphate or placebo (lactose) were given to 56 Ss in 3 successive runs on a vigilance task requiring detection of a brief pause in the steady movement of a clock hand. Ss were told that the pill would help them to keep awake. Neither the Ss nor the tester were aware of the true nature of the pills used in any particular run. At least 48 hrs. intervened between runs for a particular group. Signals occurred at a rate of 3 a min. Amphetamine had the same effect on the percentage of signals detected as on the detectability of the signals, as measured by d'. The initial level was unchanged, but the decrement was reduced. No evidence of learning was found in later runs. The effects of amphetamine and knowledge of results were additive.

R 12

25,869

Mackworth, Jane F. DECISION INTERVAL AND SIGNAL DETECTABILITY IN A VIGILANCE TASK. Canad. J. Psychol., June 1965, 19(2), 111-117. (Defence Research Medical Labs., Toronto, Ontario, Canada).

This paper discussed the effect of the assumed decision interval on the measurement of d'. Previous experiments have revealed a decrement in the detectability (d') of signals during a particular vigilance task involving the detection of a brief pause in the movement of a clock hand. In order to measure the false alarm probability, Ss were required to make a decision once every 5 sec. as to whether or not there had been a signal in the previous 5 sec. In this paper Ss were required to respond as soon as they saw a signal, and it was assumed that the decision interval was the signal duration. The 30-fold change in assumed decision interval produced very little change in the decrement in d' during the run. It is therefore concluded that the length of the assumed decision interval was not a critical factor in determining changes in d' during the continuous clock task.

R 8

25,870

Sekuler, R.W. SIGNAL DETECTION, CHOICE RESPONSE TIMES, AND VISUAL BACKWARD MASKING. Canad. J. Psychol., June 1965, 19(2), 118-132. (Psychophysiological Lab., Massachusetts Institute of Technology, Cambridge, Mass.).

Visual backward masking was studied in a signal detection context. 3 Ss were used. On each trial the tachistoscope presented 2 flashes. The initial flash (test) either contained a small dark test stripe or was a homogeneous field of equivalent luminance. Each trial was initiated by 0 at the termination of 0.5 sec. auditory signal. A trial consisted of a test flash, an inter-stimulus interval of 40 msec., and a 100 msec. masking flash. Receiver operating characteristic curves were generated by varying the probability that a test stripe would occur in the first flash of each 2-flash sequence.  $P_i$ , the a priori probability that a stripe would be presented on any trial, assumed 3 values, 0.3, 0.5, & 0.7. S was told what  $P_i$  would be during the session. During any 1 hr. session  $P_i$  was constant while the duration of the test stripe took on a different value during each third of the session. Throughout the experiment each S was tested with the same 3 stimulus durations, though these differed among the Ss. In addition to "yes-no" data, choice response times were recorded unbeknownst to 0. Times for correct responses were shorter than those for incorrect responses. The relevance of these data to models of choice time and psychophysics in general is discussed.

R 19

25,871

Pyllyshyn, Z.W. INFORMATION AVAILABLE FROM TWO CONSECUTIVE EXPOSURES OF VISUAL DISPLAYS. Canad. J. Psychol., June 1965, 19(2), 133-144. (University of Saskatchewan, Saskatoon, Saskatchewan, Canada).

2 experiments are described which used a technique of exposing a stimulus twice in succession with a variable interexposure delay. This technique was seen as allowing more time for post-exposure processing of information for a given length of exposure duration. The result of Exp. 1 confirmed the expectation that more information is available from the double than the single exposure. In addition, the amount of information available increased with increasing interexposure delays up to 5 sec. A second experiment was directed at replicating the above result with a different display and with the longest delay increased to 10.8 sec. The results confirmed the effect found in Exp. 1 except at the longest interexposure delay. The purpose of Exp. 11b was to determine how information is acquired from the 2 exposures individually for 2 of the delays (0.4 sec. & 10.8 sec.). Some of the trials in this experiment were designed so that, unknown to the S, 1 digit of the second display differed from the corresponding digit in the first display. The results showed that for the short delay almost all of the correctly reported digits originated in the second display. For the long delay about half originated from the first display. Furthermore, in a long-delay case, those originating from the first display were reported more accurately if they were towards the left end of the array whereas the reverse was true for those originating from the second display. This was taken to suggest that the more time was available to process information from a display the less susceptible would it be to interference or substitution.

R 10

25,872

Nickerson, R.S. SHORT-TERM MEMORY FOR COMPLEX MEANINGFUL VISUAL CONFIGURATIONS: A DEMONSTRATION OF CAPACITY. Canad. J. Psychol., June 1965, 19(2), 155-160. (USAF Decision Sciences Lab., Hanscom AFB, Mass.).

This experiment concerned an aspect of short-term memory somewhat neglected in the past, namely, the ability to remember, i.e., to recognize, complex meaningful visual configurations. S's task was to inspect an extended sequence of photographs of assorted content and to identify those which were occurring for the second time within the sequence. 56 Ss looked at a total of 600 black and white photographs. The first 200 photos contained no duplicates. Half of the subsequent 400 photos were duplicates, that is, they were occurring for the second time within the series. S was allowed to look at each photo for 5 sec. No responses were made to the first 200 photos. Starting with photo 201 S was cued to begin responding and thereafter the task was to designate each photo as either new or old. The probability of recognizing the recurrence of a photo as such was very high even with as many as 200 items intervening between its first and second occurrence. 15% of all responses were correct.

R 11

25,873

Lobb, H. VISION VERSUS TOUCH IN FORM DISCRIMINATION. Canad. J. Psychol., Sept. 1965, 19(3), 175-187. (University of Western Ontario, London, Ontario, Canada).

2 experiments were conducted to compare tactual and visual performance following different training. In each experiment, 4 groups of 10 Grade VIII students performed the task of discriminating an angularly shaped object from 3 similar objects. During a trial, S first examined the shape to be learned visually or tactually for about 15 sec. (reinforcement), and then received the 4 shapes in succession, visually or tactually, as a test of form discrimination. The 4 groups were distinguished by reinforcement modality and test modality in a 2x2 factorial design, repeated for 5 trials. Pooled results for 5 sets of shapes showed in the first experiment that vision was more effective than touch in learning to discriminate forms unimodally. When discrimination required joint participation of the 2 modalities, sequence vt was superior to sequence vt early in training. In the second experiment, which employed more difficult discriminations, visual superiority became further accentuated. In both experiments cross-modal conditions interacted with training. The findings tended to clarify previous inconsistencies in the literature, which were interpreted as compatible with recent evidence of visual dominance over touch. Consideration was given to some possible explanations for the weakness of form perception or discrimination by touch.

R 12

25,874

Brodsky, N. LOGISTICS RESEARCH CONFERENCE. VOLUME 11 - 8. May 1965, 159pp. Airlie Conference Center, Warrenton, Va. (AD 623232)

Following an introductory paper on the problems of measuring and evaluating logistics activities are reports having to do with logistics in the army, on ships, in the airforce, and at the managerial level. (HEIAS)

R Scattered

25,875

Greenberg, M.G. A MODIFICATION OF THURSTONE'S LAW OF COMPARATIVE JUDGMENT TO ACCOMMODATE A JUDGMENT CATEGORY OF "EQUAL" OR "NO DIFFERENCE". Psychol. Bull., Aug. 1965, 64(2), 108-112. (Proctor & Gamble Company, Cincinnati, Ohio).

A model is proposed which modifies the Thurstone law of comparative judgment extending it to the treatment of pair comparison data in which judges are permitted a judgment category of "equal" or "no difference". Based upon a rational description of the perceptual process the model introduces a threshold parameter and apportions the "equal" judgments between the 2 stimuli to estimate the actual proportions perceiving 1 greater than the other on some underlying attribute. This apportionment is carried out within the spirit of the Thurstone model and is shown to be closely approximated by splitting the "no difference" responses equally between the 2 stimuli being compared. Problems of estimation and alternative solutions are discussed as well.

R 7

25,876

Gerbrandt, L.K. NEURAL SYSTEMS OF RESPONSE RELEASE AND CONTROL. Psychol. Bull., Aug. 1965, 64(2), 113-123. (Claremont Graduate School, Claremont, Calif.).

A descriptive model of control and release functions of behavior was derived from recent brain research literature on this topic. The model allowed comparisons to be made between several common behavioral tasks as well as within the acquisition to retention phases on each of these tasks. Electrophysiological, neurological, and psychopharmacological effects known in the literature were seen to be ordered by the model which assumed specified mutually inhibitory brain systems to underlie the behavioral functions of release and control of responses.

R 81

25,877

Peterson, L.R. A NOTE ON REPEATED MEASURES IN THE STUDY OF SHORT-TERM MEMORY. Psychol. Bull., Aug. 1965, 64(2), 151-152. (Institute of Human Learning, University of California, Berkeley, Calif.).

Keppel's (HEIAS 25,810) objection to averaging over repeated measures is discussed. Several possibilities for minimizing proactive interference are suggested, including increasing time between tests. Consideration is given to acceptance of a constant amount of proactive interference over conditions in which other variables are studied. The advantages of using repeated measures in regard to efficiency as well as interpretation are noted.

R 7

25,878

Buckner, D.N., Harabedian, A. & McGrath, J.J. INDIVIDUAL DIFFERENCES IN VIGILANCE PERFORMANCE. J. engng. Psychol., 1965, 4(3), 69-85. (Human Factors Research, Incorporated, Santa Barbara, Calif.).

This is a report of an exploratory study of individual differences in the performance of a vigilance task. The purposes of the study were to investigate: the magnitude of individual differences both within a watch and from 1 watch to the next, the relationship between the performances of the same individuals on a visual and on an auditory vigilance task, and the relationship between the performances of the same individuals under alerted and ordinary watch standing conditions. 54 Ss participated in the study. 2 watch standing tasks were used. In one, the Ss were required to detect a change in the loudness of a 750 cps tone presented over head-phones. The tone was on for 1 sec. and off for 2. In the other task, the Ss were required to detect a change in the brightness of a light appearing in a 1 in. square ground glass covered aperture. Each S stood a total of 32 1-hour watches, 16 on the visual display and 16 on the auditory. Each S received a total of 384 signals during the total 32 watches. The following results are discussed: a) performance dropped below the alerted, pretest levels almost immediately after the regular watch began. An additional decrement took place within the watch. Performance returned abruptly and completely to pretest levels on the alerted posttest; b) the declines in performance occurred in both sensory modes and under different signal rates. Individual differences were smallest under the alerted conditions and became larger as the watch progressed; c) under alerted conditions, performance on the visual task was superior to that on the auditory task, yet performance during the watches was poorer on the visual. A significant interaction between sensory mode and fortnight was also noted. (HEIAS)

R 12

25,879

Harris, D.H. INFORMATION TRANSMITTAL PERFORMANCE WITH ALPHANUMERIC FORMS. J. engng. Psychol., 1965, 4(3), 86-91. (Autonetics, Anaheim, Calif.).

A new approach to information transmittal involves the use of devices such as the IBM Optical Mark Page Readers (1963) which permit more direct transmission of information into data processing systems. Information is recorded at its source on alphanumeric forms by marking appropriate letter, number and word alternatives. The forms are fed into a device which transmits recorded information directly into a computer or punches it onto cards. Positions of the marks on the form provide the basis for data conversion. Since employee performance in marking appropriate letters and numbers is a critical factor in the approach, this study was conducted to compare information transmittal performance using alphanumeric forms with performance using conventional forms, in terms of speed and accuracy of transmittals. The study was conducted within the context of a quality control information system. 8 experienced inspectors made 60 information transmittals each; 30 were made using conventional forms and 30 using alphanumeric forms in a counterbalanced experimental design. Transmittals with conventional forms were made in half the time required for transmittals with alphanumeric forms. There were no statistically significant differences between forms in accuracy of transmittals.

R 1

25,880

Kobrick, J.L. EFFECTS OF EXPOSURE TO LOW AMBIENT TEMPERATURE AND WIND ON VISUAL ACUITY. J. engng. Psychol., 1965, 4(3), 92-98. (USA Research Institute of Environmental Medicine, Natick, Mass.).

No systematic study has been made of the independent and combined effects of environmental exposure variables on visual performance, or of the relevant ranges of exposure severity capable of producing visual impairment. Therefore, the present research was undertaken as an initial effort aimed toward a general determination of the effects of such exposure within practical ranges on visual performance; specifically in this study, the effects of ambient temperature and wind on visual acuity. 12 Ss participated in the experiment. The experimental task involved determination of threshold visual acuity, defined as the minimum separable distance between 2 vertical lines, during superficial exposure of the eyes to all combinations of 5 ambient temperature treatments (70°, 20°, 0°, -20° & 40°F) and 4 windspeed treatments (0, 10, 20, & 30 miles per hr.). All trials were conducted in a climatic chamber in which the Ss sat at a viewing distance of 20 ft. from the apparatus used to present the task. Upon hearing a signal from the E, the S faced the task for 30 sec. of pre-exposure to the appropriate windspeed-temperature combination. On a second signal from the E, the S pushed a switch until the lines appeared to be just separated. The arithmetic means of the combined ascending and descending threshold determinations for each S for each temperature-windspeed combination were computed, and the statistical analysis was based on these values. The main effects of both temperature and windspeed were statistically significant, ( $p < .001$ ), as the temperature decreased and as windspeed increased the threshold values generally became larger. Visual acuity decrements for brief exposures can only be expected to obtain for treatment values beginning somewhere between -20° & -40°F, and between 20 & 30 mph windspeeds.

R 27

25,881

Thurmond, J.B. & Alluisi, E.A. EFFECTS OF TWO TASK VARIABLES ON THE VISUAL PERCEPTION OF FORM. J. engng. Psychol., 1965, 4(4), 101-107. (University of Louisville, Louisville, Ky.).

In this study a paper-and-pencil figure-cancellation task was used to measure the effects on form perception of 2 task variables and a transphenomenal parameter. The task variables were: a) the number of alternatives from which a choice figure that matched the target figure was to be identified and cancelled (3 vs 8); and b) the consistency with which a matching figure was included among these alternatives (always vs not always present). The use of figure was constrained (Redundancy-1) as well as random metric figures constituted the transphenomenal parameter. A factorial design was employed so that interactions of the 3 dimensions could be assessed. 48 Ss participated in the experiment. The task variables were found to affect performance significantly, in terms of both speed and accuracy of figure identification (and cancellation). More importantly, these variables were found to interact significantly with each other and with the type of figure used; these interactions are interpreted as placing serious limitations on the generality of studies of visual form perception.

R 13

25,882

Shoenberger, R.A. & Harris, C.S. HUMAN PERFORMANCE AS A FUNCTION OF CHANGES IN ACOUSTIC NOISE LEVELS. J. engng. Psychol., 1965, 4(4), 108-119. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

This experiment was designed to compare the effects of 4 different noise levels upon performance. 16 Ss were used. The 3 experimental conditions each began with different intensities (Quiet, 85 db, or 95 db). After 30 min. they were switched to a final, high intensity level (110 db) for 15 min. The 4th condition served as a control, in which Quiet prevailed throughout the entire 45 min. period. Performance was measured by means of the Tsai-Partington Numbers Test. The experimental design was a counterbalanced treatment by Ss design, in which each S took all 4 treatments in 1 of 4 counterbalanced orders. The specific hypothesis to be tested was that the greater the magnitude of the change in intensity, the greater will be the decrement produced. The F-test for the main effects of the noise conditions was not significant. However, in evaluating the simple effects of the noise conditions for each session the results showed that the Quiet-110 & 85-110 noise conditions produced significantly poorer performance than the 95-110 and Quiet-Quiet conditions. From these results it would appear that there is partial support for the original hypothesis. (HEIAS)

R 19

25,883

Halcomb, C.G. & Kirk, R.E. EFFECTS OF AIR IONIZATION UPON THE PERFORMANCE OF A VIGILANCE TASK. J. engng. Psychol., 1965, 4(4), 120-126. (Baylor University, Waco, Tex.).

The purpose of the present study was to assess the effects of positive and negative ionization of the air upon the performance of a vigilance task. Such tasks are often performed in environments which are conducive to the development of concentrations of positive ions. 40 Ss participated in the experiment. The Ss were randomly assigned to 1 of the 2 ionization conditions. Each S knew that he was participating in a study of monitoring performance, but knew nothing of the ionization conditions. Upon entering the experimental room S was seated in front of the visual display and a small metal probe for measuring skin temperature was attached to his left wrist. The purpose of this probe was to prevent S from walking about or standing up during the 4-hr. monitoring session. Each S was given a 20 min. period prior to the 4-hr. monitoring session to become acclimated to the experimental environment and to provide sufficient time for the ions to have an effect. The hypothesis that there may be less decrement in S's ability to perform a vigilance task if the environment in which he works contains negative rather than positively ionized air was verified.

R 28

25,884

Dudek, R.A. & Clemens, D.E. EFFECT OF VIBRATION ON CERTAIN PSYCHOMOTOR RESPONSES. J. engng. Psychol., 1965, 4(4), 127-143. (Texas Technological College, Lubbock, Tex.).

The research reported here was an investigation of the influence of vertical vibration within the limits encountered in typical industrial conditions upon the various elements of total cycle time in performing certain types of hand motions. The device used in this study was a mechanical shake table, on which was mounted a work station and a seat. The pulleys and crank used in the experiment were designed to deliver the frequencies of 4, 8, & 12 cps and amplitudes of 0.15, 0.20, & 0.25 in., while utilizing a 1750 rpm motor. 3 switches were mounted on the console backboard at equal distances from the key switch. Each switch had a stimulus light located approximately 1 in. below it. 27 Ss participated in the experiment. Before each test, the vibration table was set for the desired amplitude and frequency of vibration. 1 of 6 possible switch panel layouts was chosen at random and affixed to the table. A cycle was begun with the S holding the telegraph key down. When a red stimulus light came on he activated the switch directly above the red light, and then let his right arm relax on the table surface. When the red light went off, he again depressed the telegraph key and was ready for another trial. In the test, each switch was operated 5 times during each of the 3 test periods. Data was recorded on both of the main effects (reaction and performance time) of each trial. Within the scope of this experiment, reaction time is not affected by vibration when compared with the control period. The interaction between frequency, amplitude and score is discussed and all 3 variables are examined separately.

25,885

Kobrick, J.L. EFFECTS OF PHYSICAL LOCATION OF VISUAL STIMULI ON INTENTIONAL RESPONSE TIME. J. engng. Psychol., Jan. 1965, 4(1), 1-8. (USA Research Institute of Environmental Medicine, Natick, Mass.).

The effects of physical location of visual stimuli on the IRT were investigated. 16 Ss performed a simple manual response to flash stimuli located at 32 different positions in the visual field. The stimuli were presented by an apparatus consisting of a hemispherical bowl similar to an optical perimeter with a radial span of 200°. IRT measurements were obtained with the bowl set at each of the following angles of inclination: a) right side at 0°, left side at 180° (horizontal); b) right side at 30° inclination, left side at 210° declination (right upward tilt); c) right side at 280° declination, left side at 100° inclination (almost vertical); and d) right side at 330° declination, left side at 150° inclination (left upward tilt). The results indicated that IRTs were unaffected for most lower visual hemisphere locations. Significant decrements were only observed for locations higher than 30° above the horizontal for lateral displacements greater than 55° from center. No significant decrements were observed even at the periphery for locations along the horizontal line of sight.

R 13

25,886

Medeiros, R.B., White, R.K. & Ayoub, M.M. THE EFFECT OF LIGHT AND SOUND VARIABLES ON REACTION TIME. J. engng. Psychol., Jan. 1965, 4(1), 9-21. (Texas Technological College, Lubbock, Tex.).

Simple reaction time was measured for 8 college males at various combinations of light level, noise level, stimulus intensity, and shade of background to see if the interaction of these variables would significantly affect RT. 10 trials were taken at each treatment condition. Trial 1 was significantly longer than the remaining 9 trials. The effect of stimulus intensity was highly significant with more intense stimulus causing the longer RT. At low levels of light with the grey background, S adaptation was similar to that of the black backgrounds; at high levels of light with the same background, adaptation was similar to the white background. Noise levels and light levels interacted, suggesting that 3 phases of intersensory interaction between sound and vision receptors exist. The results of the experiment demonstrates the need to more adequately record light and noise on various thresholds of light, especially the pain threshold and vice-versa.

R 10

25,887

Caldwell, L.S. RECOVERY FROM THE EFFECTS OF ISOMETRIC MUSCLE CONTRACTIONS. J. engng. Psychol., Jan. 1965, 4(1), 22-29. (USA Medical Research Lab., Fort Knox, Ky.).

The purpose of this investigation was to determine the recovery functions for moderately light and heavy isometric muscle contractions. The maximum response strength was determined for each S who was then required to maintain either a moderate or a heavy load as long as possible, and the contraction time (endurance) was measured. Each load was a given percentage of S's maximum response strength. The ability to maintain the same load was then determined after various rest intervals. Endurance recovery was expressed as the ratio of the 2nd endurance score to the 1st. Recovery from the effects of exertion was found to follow a negatively accelerated growth function with endurance recovery being faster for the heavy load than for the lighter one.

R 16

25,888

Olynyk, D. & Northwood, T.D. SUBJECTIVE JUDGMENTS OF FOOTSTEP-NOISE TRANSMISSION THROUGH FLOORS. J. Acoust. Soc. Amer., Dec. 1965, 38(6), 1035-1039. (Building Research Div., National Research Council, Ottawa, Ontario, Canada).

The current procedure for assessing impact transmission through floors involves comparing the spectra of transmitted noise produced by a standard tapping machine. An obvious weakness in the method is that it does not really simulate footsteps. One is more interested, however, in how well the method rank-orders floor structures as compared with the impressions of an apartment dweller listening to his upstairs neighbor. This project was intended to provide a partial answer to this complex question. Subjective comparisons were made of the "loudnesses" of footsteps on a concrete slab floor with various added structures. Comparison with FHA ratings indicates that the ratings exaggerate the differences between the floors in the most unacceptable range, but that there is a reasonable degree of correlation among the important range of floors. A variation of the FHA procedure that improves the correlation is also reported. The conclusions to be drawn from these studies is that, for these categories of floors, the impact-machine method is a valid one for rating reasonable acceptable floors, although some unacceptable floors, equivalent in performance to bare concrete, are overrated. It appears that the range of validity of the rating system could be extended downward by a modification of the present method of interpreting impact-machine data. This tentative observation needs confirmation, however, with tests on other floor structures.

R 6

25,889

Egan, J.P. MASKING-LEVEL DIFFERENCES AS A FUNCTION OF INTERAURAL DISPARITIES IN INTENSITY OF SIGNAL AND OF NOISE. J. Acoust. Soc. Amer., Dec. 1965, 38(6), 1043-1049. (Hearing & Communication Lab., Indiana University, Bloomington, Ind.).

A marked release from masking, or masking-level difference (MLD), results when a monaural signal is presented with perfectly correlated (in-phase) binaural noise, NO--Sm, rather than with monaural noise, Nm--Sm. When the noise in the nonsignal ear is introduced at a lower level than that in the signal ear, a smaller MLD results. In 1 experiment, MLD's were determined as a function of the intensity of the noise in the nonsignal ear with the interaural conditions of NO, N7, and NU as parameters; for NO, there is some release from masking even when the noise in the nonsignal ear is as much as 40 db down from that in the signal ear. The following considerations led to a second experiment. A release from masking results when a sinusoid is presented monaurally Sm rather than binaurally and in phase S0 with perfectly correlated noise NO. With NO-S0, when the sinusoid in 1 ear is reduced in intensity, rather than being removed entirely, a smaller MLD than for NO-Sm should result. Therefore, MLD's were determined as a function of the ratio of the energies of the left- and right-ear sinusoids with correlated noise NO. In all experiments, the signal (500 cps, 0.25 sec) was presented to the listener in 1 or the other of 2 temporal intervals, against a background of white noise. Psychometric functions were determined for each condition, and MLD's were estimated from these functions.

R 18

25,890

Sidley, N.A., Winograd, E. & Bedarf, E.W. LEARNING TO IDENTIFY COMPLEX SOUNDS: PROMPTING VERSUS CONFIRMATION. J. Acoust. Soc. Amer., Dec. 1965, 38(6), 1050-1052. (Honeywell Incorporated, St. Paul, Minn.).

3 groups of Ss were taught to identify, by label, complex sounds. With temporal overlap controlled, confirmation and prompting training procedures were compared. Despite recent emphasis on the superiority of prompting procedures, no significant difference in the efficacy of the 2 methods was observed.

R 6

25,891

Weston, P.B., Miller, J.D. & Hirsh, I.J. RELEASE FROM MASKING FOR SPEECH. J. Acoust. Soc. Amer., Dec. 1965, 38(6), 1053-1054. (Central Institute for the Deaf, St. Louis, Mo.).

Intelligibility scores were obtained from 12 listeners for monosyllabic words presented monaurally with noises at 1 or both ears. Release from masking previously reported by Licklider (J. Acoust. Soc. Am. 20, 150-159 (1948)) was confirmed, but sizable differences between right and left ears in the amount of release were not found. However, 1 listener consistently had about 5% more release for speech at the right than the left ear.

R 5

25,892

Middleton, D. & Groginsky, H.L. DETECTION OF RANDOM ACOUSTIC SIGNALS BY RECEIVERS WITH DISTRIBUTED ELEMENTS: OPTIMUM RECEIVER STRUCTURES FOR NORMAL SIGNAL AND NOISE FIELDS. J. Acoust. Soc. Amer., Nov. 1965, 38(5), 727-737. (Advanced Development Lab., Raytheon Co., Wayland, Mass.).

This paper deals with the passive detection of noiselike signals in the presence of both external (environmental) noise and self-generated (receiver) noise, using an array of transducers. Starting with the Bayesian formulation of the general detection problem, a set of matrix integral equations is derived whose solution yields the optimum detector function. By regarding the resultant time-varying filters as operators and the defining matrix integral equations as a set of operational equations, it is possible to examine the underlying structure of the optimum detector most easily. It is shown, thereby, that factorization of the space-time operations (i.e., separation of the required filter into 2 successive operations--the first depending only on the geometry of the array, the second depending only on the statistics of the noise processes) is not, in general, possible in optimum systems. Only in the strong-signal case has it been possible to show that factorization analogous to conventional beam forming can be utilized in optimum array detection. Another interesting conclusion is that an optimum detector is not superdirective in the limiting case of strong external directive noise.

R 23



25,893  
Elliott, Lois L. CHANGES IN THE SIMULTANEOUS MASKED THRESHOLD OF BRIEF TONES. *J. Acoust. Soc. Amer.*, Nov. 1965, 38(5), 738-746. (Central Institute for the Deaf, St. Louis, Mo.)

Simultaneous monotonic masking of a 5- or 1-msec, 1000-cps signal by bursts of wide-band noise of 30-1000 msec duration (70 db SPL) changes and is dependent upon delay of the tone ( $\Delta t$ ) relative to masker onset. The elevated masking of the tone at short  $\Delta t$ 's (overshoot) is independent of masker duration, while minimum masking occurs at delay times of 200 or 300 msec. A 500-msec-long, 400-cps noise band centered at 2550 cps produces little overshoot for 10-msec tonal signals with frequencies located within the band but considerable overshoot for frequencies just outside it. This occurs also for a 200-cps band centered at 1270 cps but not for a 100-cps band at 250 cps. These effects were observed for dichotic masking also. For 500-msec bursts of wide-band masking noise, greater overshoot occurs at higher signal frequencies than at lower. Several different psychophysical procedures produced similar results.

R 17

25,894  
Rosenberg, A.E. EFFECT OF MASKING ON THE PITCH OF PERIODIC PULSES. *J. Acoust. Soc. Amer.*, Nov. 1965, 38(5), 747-758. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

The pulse-train pitch-matching experiments of Flanagan & Guttman have been extended to investigate the effect of selective masking on the pitch of these stimuli. For unmasked stimuli, at pulse repetition rates below approximately 150 pps, a pitch mode correlated with the pulse repetition rate is generally obtained; at fundamental frequencies higher than approximately 150 cps (and below 800 cps), a pitch mode correlated with the fundamental frequency is generally obtained even if the fundamental component has been rejected from the challenge stimulus by filtering. There is a transition region of repetition rates of the challenge stimulus in which the cues for both pitch modes are strongly competing. Present results indicate that if, to challenge stimuli in or near the transition region, high-pass noise (1000 cps cutoff) is added the "buzz" quality associated with the pulse-rate mode can be masked and a fundamental-frequency pitch judgment elicited. Conversely, low-pass noise (1000-cps cutoff) can mask the "tonal" quality associated with the fundamental-frequency mode and elicit pulse-rate pitch judgments. Narrow bands of noise or sinusoids are equally effective as maskers. Fundamental-frequency pitch judgments and pulse-rate pitch judgments are suppressed by narrow bands of noise or sinusoids centered at about 500 & 5000 cps, respectively. It is concluded that, for pulse-train stimuli with repetition rates in or near the transition region, fundamental-frequency and pulse-rate pitch modes are associated with distinct auditory channels below 1000 and above 1000 cps, respectively, with special prominence to the regions near 500 and 5000 cps, respectively. It is further suggested that these results tend to support periodicity mechanisms for mediating these modes of pitch perception.

R 33

25,895  
Rutschmann, J. & Rubinstein, L. BINAURAL BEATS AND BINAURAL AMPLITUDE-MODULATED TONES: SUCCESSIVE COMPARISON OF LOUDNESS FLUCTUATIONS. *J. Acoust. Soc. Amer.*, Nov. 1965, 38(5), 759-768. (New York State Psychiatric Institute & Columbia University, New York, N.Y.).

An objective psychophysical method for measuring 1 of the results of binaural (neural) interaction to low-intensity pure tones is presented. Successive comparison of the strength of loudness fluctuations of binaural beats (BB) with loudness fluctuations produced by binaurally presented amplitude-modulated tones is used. The dependency of the percent amplitude modulation (AM) required for a match on stimulus parameters is investigated. At a given frequency level of the tones, the matches are not affected when the frequency difference is changed from 2 to 6 cps. The %AM required for a match increases when sensation level (SL) decreases from 30 to 10 db. When frequency level is changed, the matches are about the same for 150 & 300 cps, but much less AM is required at 600 cps. The discussion is centered on the relationship of the matches to appropriate detection thresholds for AM. Changes in the detection threshold with SL fail to predict the corresponding changes in the matches; e.g., when the SL is lowered, the %AM for detection increases less than the modulation required for the match.

R 14

25,896  
Toole, F.E. & Sayers, B. McA. INFERENCES OF NEURAL ACTIVITY ASSOCIATED WITH BINAURAL ACOUSTIC IMAGES. *J. Acoust. Soc. Amer.*, Nov. 1965, 38(5), 769-779. (Electrical Engineering Dept., Imperial College, London, England).

Experimental results relating to the nature of acoustic images arising from binaural, wide-band acoustic transients are reported. In addition to the tonal harmonic images that may be identified in certain circumstances, there appear to be 2 dominant images of impulsive character. The latter images appear to be associated with neural activity arising in specific regions of the cochlea; their lateralization characteristics may be interpreted in terms of inferred temporal features of the basilar-membrane responses in the relevant regions. Implications germane to the physiological mechanisms of binaural interaction are discussed.

R 9

25,897  
Hillix, W.A., Fry, M.N. & Hershman, R.L. COMPUTER RECOGNITION OF SPOKEN DIGITS BASED ON SIX NONACOUSTIC MEASURES. *J. Acoust. Soc. Amer.*, Nov. 1965, 38(5), 790-796. (USN Electronics Lab., San Diego, Calif.).

6 low-bandwidth measures were used in 3 types of programs for the automatic recognition of spoken digits. The measures were chosen to be closely related to articulatory rather than to acoustic properties of speech. The first program, without any learning feature, asked specific questions about the values of the 6 measures; its accuracy ranged from 64% to 97% correct. 2 speaker/specific programs, which learned with a sample of 2 utterances per digit, yielded accuracies averaging 97% when tested on new utterances from the same talker. Performance fell to 88% & 94% when learning was carried out on a pool of 4 speakers, and to 78% & 86% when a 3-speaker pool provided the learning for classification of a fourth speaker's utterances. It is suggested that such "nonacoustic" measures can be of substantial value in more-general speech-recognition procedures.

R 9

25,898

Young, R.W. RE-VISION OF THE SPEECH-PRIVACY CALCULATION. *J. Acoust. Soc. Amer.*, Oct. 1965, **38**(4), 524-530. (USN Electronics Lab., San Diego, Calif.).

The articulation index used in telephone communication, the listening equation for sonar, and the acoustical-privacy calculation of architectural acoustics are all founded on a computation of an excess of signal level over noise level just sufficient to permit some stated detectability. From this viewpoint, data compiled for "Speech Privacy in Buildings" by Cavanaugh, Farrell, Hirtle, & Watters (*J. Acoust. Soc. Amer.* **34**, 475-492 (1962)) have been reviewed for possible simplifications in their procedure for estimating acoustical privacy. Interrelations are demonstrated among various current methods for rating noise and sound insulation, and a general equation for acoustical privacy is derived. As an example, for the case of "confidential" privacy, 200-ft floor area, and raised voice, satisfactory acoustical privacy is to be expected if  $D+NA=85$  db, where  $D$  is the sound isolation between the rooms (the reduction of sound from 1 room to the next) as rated by a procedure like that for the sound-transmission class, and  $NA$  is the background-noise level in the receiving room measured with a sound-level meter on A-weighting.

R 15

25,899

Carterette, E.C., Friedman, M.P. & Cosmides, R. REACTION-TIME DISTRIBUTIONS IN THE DETECTION OF WEAK SIGNALS IN NOISE. *J. Acoust. Soc. Amer.*, Oct. 1965, **38**(4), 531-542. (Human Communication Lab., University of California, Los Angeles, Calif.).

Reaction times were collected for 3 Os in a YES-NO signal-detection experiment, for 2 different signal strengths, and 3 a priori probabilities of a signal occurrence-- $P(S)$ : 0.2, 0.5, & 0.8. Each O gave 1800 responses under each of the 6 conditions. A trial ended only when the O terminated it. Some of the major findings are: a) latencies have Pearson distributions, mainly Beta of the first and second kind; b) there is an apparent genetic character to the distributions--that is, they resemble each other according to the response (YES or NO) rather than the stimulus (signal or noise alone); c) at  $P(S)=0.2$ , the mean latency of a false rejection of a signal is least, that of a correct detection greatest, but for  $P(S)=0.5$  & 0.8, mean latency is least for correct detection, and greatest for correct NO's; and d) generally, reaction times are inversely related to the a priori probability of their associated classes.

R 26

25,900

Elfner, L. & Caskey, W.E. CONTINUITY EFFECTS WITH ALTERNATELY SOUNDED NOISE AND TONE SIGNALS AS A FUNCTION OF MANNER OF PRESENTATION. *J. Acoust. Soc. Amer.*, Oct. 1965, **38**(4), 543-547. (Kent State University, Kent, Ohio & Hawthornden State Hospital, Macedonia, Ohio).

An experiment is reported on continuity effects produced in a longer-duration, less-intense noise signal alternating with a shorter-duration, higher-intensity tonal signal. The perceived continuity in the noise signal is demonstrated to be significantly affected by the following: a) the frequency of the tonal signal (200, 400, 1000, 2000, & 4000 cps); b) the duration of the noise signal (70, 250, & 950 msec); and c) the manner of presentation (monaural vs dichotic). Monaural thresholds were found to be larger than dichotic continuity thresholds. Continuity effects were demonstrated under dichotic presentation. That is, the noise signal was reported as continuous when interrupted for periods of time that would be clearly perceived if no tonal signal were interpolated in the interruptions of the noise. A 2-factor theory is forwarded to explain the dichotic and monaural continuity effects. The monaural effects are discussed in terms of rate of decay of auditory sensation. The dichotic effects are discussed in terms of facilitation of ongoing neural discharge somewhat more central than the first-order neurons.

R 6

25,901

Piomp, R. & Levelt, W.J.M. TONAL CONSONANCE AND CRITICAL BANDWIDTH. *J. Acoust. Soc. Amer.*, Oct. 1965, **38**(4), 548-560. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

Firstly, theories are reviewed on the explanation of tonal consonance as the singular nature of tone intervals with frequency ratios corresponding with small integer numbers. An evaluation of these explanations in the light of some experimental studies supports the hypothesis, as promoted by von Helmholtz, that the difference between consonant and dissonant intervals is related to beats of adjacent partials. This relation was studied more fully by experiments in which Ss had to judge simple-tone intervals as a function of test frequency and interval width. The results may be considered as a modification of von Helmholtz's conception and indicate that, as a function of frequency, the transition range between consonant and dissonant intervals is related to critical bandwidth. Simple-tone intervals are evaluated as consonant for frequency differences exceeding this bandwidth, whereas the most dissonant intervals correspond with frequency differences of about a quarter of this bandwidth. On the base of these results, some properties of consonant intervals consisting of complex tones are explained. To answer the question whether critical bandwidth also plays a role in music, the chords of 2 compositions (parts of a trio sonata of J.S. Bach and of a string quartet of A. Dvorak) were analyzed by computing interval distributions as a function of frequency and number of harmonics taken into account. The results strongly suggest that, indeed, critical bandwidth plays an important role in music: for a number of harmonics representative for musical instruments, the "density" of simultaneous partials alters as a function of frequency in the same way as critical bandwidth does.

R 38

25,902

Wickelgren W.A. DISTINCTIVE FEATURES AND ERRORS IN SHORT-TERM MEMORY FOR ENGLISH VOWELS. *J. Acoust. Soc. Amer.*, Oct. 1965, **38**(4), 583-588. (Psychology Dept., Massachusetts Institute of Technology, Cambridge, Mass.).

Errors in short-term recall of 6 English vowels (i, e, æ, u, ʌ, a) were tabulated and related to several distinctive-feature systems. Vowels were embedded in 2 contexts: /i( ) k/ and /z( ) k/. Ss were instructed to copy items as they were presented, followed by recall of the entire list of (6) items. Perceptual errors were excluded from the recall error matrix by scoring for recall only correctly copied items. The rank-order frequency of different intrusions in recall of each presented vowel was almost perfectly predicted by a conventional phonetic analysis in 2 dimensions: place of articulation (front, back) and openness of the vocal tract (narrow, medium, and wide). The error matrix also supported the assumptions that the values of openness are ordered in short-term memory and that the correct value on the openness dimension is more likely to be forgotten than the correct value on the place dimension. The study suggests that a vowel is coded in short-term memory, not as a unit, but as a set of 2 distinctive features, each of which may be forgotten independently.

R 10

25,903

Corliss, Edith L.R. & Winzer, G.E. STUDY OF METHODS FOR ESTIMATING LOUDNESS. *J. Acoust. Soc. Amer.*, Sept. 1965, 38(3), 424-428. (US National Bureau of Standards, Washington, D.C.).

The methods for computing loudness developed by Zwicker & Stevens were applied to several complex sounds encountered in our work on architectural acoustics. The loudnesses computed on the basis of Steven's method did not agree closely with the loudnesses computed by Zwicker's method, and the results obtained by using the 2 methods were not related to one another in any consistent way. Further, studies with Ss showed that both sets of computations gave results at variance with the responses of the Ss. Investigation of the loudness-vs-frequency contours for our Ss showed closer conformity to the Fletcher & Munson data than to the more recent equal-loudness contour reported by the National Physical Laboratory, the functions reported by Zwicker, or the band-pressure levels that form the basis for the loudness weighting in Stevens' method. However, this feature does not suffice to account for the discrepancies observed.

R 11

25,904

Keidel, W.D. & Spreng, M. NEUROPHYSIOLOGICAL EVIDENCE FOR THE STEVENS POWER FUNCTION IN MAN. *J. Acoust. Soc. Amer.*, Aug. 1965, 38(2), 191-195. (Physiology Dept., University of Erlangen-Nurnberg, Erlangen, West Germany).

Human evoked cortical responses to acoustic stimuli occurring within 150-170 msec after stimulus onset yielded input-output functions fairly comparable with Stevens' power functions from psychophysical experiments. The objective threshold and equal-loudness contours thus obtained were both in fair agreement with the well-known subjective measurements.

R 15

25,905

Moray, N., Bates, A. & Barnett, T. EXPERIMENTS ON THE FOUR-EARED MAN. *J. Acoust. Soc. Amer.*, Aug. 1965, 38(2), 196-201. (Psychology Dept., University of Sheffield, Sheffield, England).

Ss were required to listen to messages consisting of 1, 2, 3, or 4 letters of the alphabet over each of 1, 2, 3, or 4 channels. It was found that increasing the number of channels above 2 had a markedly deleterious effect upon recall of the messages, 2 letters over each of 4 channels being less well recalled than 4 letters over each of 2 channels. In a 2nd experiment, it was found that, providing only 1 channel was required in recall, and this one indicated by a light immediately after the stimuli had been presented, then the decrement could be largely offset and the total number of signals stored held constant at about 8 regardless of how many channels were used. However, if the letters had to be recalled in exactly the correct order in which they arrived, performance dropped to almost zero. The results are discussed in terms of the channel capacity of the nervous system and in relation to corresponding findings in other sense modalities.

R 6

25,906

Rilling, M.E. & Jeffress, L.A. NARROW-BAND NOISE AND TONES AS SIGNALS IN BINAURAL DETECTION. *J. Acoust. Soc. Amer.*, Aug. 1965, 38(2), 202-206. (Psychology Dept., Indiana University, Bloomington, Ind. & Defense Research Lab., University of Texas, Austin, Tex.).

2 experiments compare the effect of fixed and random phase relations between masker and signal in binaural masking. In Exp. 1, a comparison is made between interaural time delay and phase shift of a narrow-band-noise signal where the phase relations between the signal and the masker are random. The signal is Gaussian noise passed through a 50 cps filter centered at 500 cps. The masker is broad-band noise from a second noise generator. The conditions using noise as the signal are compared with the same conditions in which a 500 cps tone is the signal. A 2-interval, forced-choice procedure was used to obtain MLD's (masking level differences). The MLD increases rapidly as the interaural phase shift or interaural time delay increases. The MLD's for corresponding phase-shift and time-delay conditions are approximately the same for tonal and noise signals. In Exp. 2, a single noise generator is used and a comparison is made between NO S0 & NO S77 for various phase relations between the narrow-band-noise signal and the masker. The noise signal has the same bandwidth as in Exp. 1. The results show a substantial dependence of the MLD's on the signal-noise phase relation.

R 7

25,907

Sorkin, R.D. UNCERTAIN SIGNAL DETECTION WITH SIMULTANEOUS CONTRALATERAL CUES. *J. Acoust. Soc. Amer.*, Aug. 1965, 38(2), 207-212. (Sensory Intelligence Lab., University of Michigan, Ann Arbor, Mich.).

A series of auditory signal-detection experiments was run under conditions of signal-parameter uncertainty. This uncertainty was effected by allowing 1 signal parameter, either signal frequency or starting time, to vary randomly across the sequence of experimental trials. These experiments, run monaurally, employed a simple yes-no detection procedure, signal plus noise occurring on half of the trials and noise alone occurring on the other half. A series of comparison experiments using the same Os was run under identical conditions, with the addition of a simultaneous cue signal in the contralateral ear. This cue was present on both signal and no-signal trials and was identical, in all parameters except amplitude, to the signal that might have been presented to the detecting ear. The results demonstrated: a) the previously noted result--that a simultaneous contralateral cue degrades performance at relatively high signal-to-noise levels--; and b) a new result--that at low signal levels such a cue facilitates performance of the detection task. The degrading effect is a function of the cue signal energy. The resulting psychometric functions suggest an interpretation in terms of a crossmasking and uncertainty-reduction hypothesis.

R 14

25,908

Dammann, J.E. APPLICATION OF ADAPTIVE THRESHOLD ELEMENTS TO THE RECOGNITION OF ACOUSTIC-PHONETIC STATES. J. Acoust. Soc. Amer., Aug. 1965, 38(2), 213-223. (International Business Machines Corporation, Poughkeepsie, N.Y.).

The relation of acoustic-phonetic states to the problem of speech recognition is discussed. It is suggested that a first step toward understanding the dynamics of the speech signal could be made by recognizing a small number of acoustic-phonetic classes. Adaptive threshold elements are proposed as a means of recognizing these classes and a method of utilizing the adaptive threshold elements in a decision procedure is presented. The means employed to gather the data representing the classes consists essentially of taking amplitude samples from a bank of 15 filters at 10 msec intervals. Samples obtained in this manner are used as input for the adaptive-decision procedure, which is simulated in a general-purpose computer. Samples representative of each class are used to train the adaptive-decision procedure, and the capability to generalize to new samples is observed. For 1 speaker, generalization results of 92%-correct sample classification were achieved, and generalization from 1 speaker to another was demonstrated. It further was shown that the selection of an output code can significantly affect the generalization and that sequences of recognized samples can represent dynamic changes through words.

R 6

25,909

Peterson, G.E. & Hanne, J.R. EXAMINATION OF TWO DIFFERENT FORMANT-ESTIMATION TECHNIQUES. J. Acoust. Soc. Amer., Aug. 1965, 38(2), 224-228. (Communication Sciences Lab., University of Michigan, Ann Arbor, Mich.).

The errors associated with 2 formant-frequency estimators are compared theoretically for the simple case of a single steady-state isolated formant. The estimators considered are: a) the zero-crossing frequency; and b) the frequency of the highest-energy harmonic. The results of the analyses show that for a given harmonic the zero-crossing counter gives the smallest magnitude error while the highest-energy harmonic tracker gives the smallest percentage error.

R 5

25,910

Birdsall, T.G. & Roberts, R.A. THEORY OF SIGNAL DETECTABILITY: DEFERRED-DECISION THEORY. J. Acoust. Soc. Amer., June 1965, 37(6), 1064-1074. (Cooley Electronics Lab., University of Michigan, Ann Arbor, Mich.).

The theory of signal detectability is extended to include observation-decision procedures in which the available observation time is bounded. The special case of a simple signal hypothesis with stationary normal observation statistics is worked in detail. ("Signal known exactly in added white Gaussian noise" is an example of such a case). The optimization is of the minimum average risk type, with constant cost of observation to facilitate comparison with work based on Wald's sequential analysis and comparison with fixed observation procedures. An unexpected result is that for large available observation lengths, approaching Wald's unbounded case, the optimization dictates that the primary improvement is in error performance rather than observation time.

R 5

25,911

Eijkman, E. & Venfrik, A.J.H. CAN A SENSORY SYSTEM BE SPECIFIED BY ITS INTERNAL NOISE? J. Acoust. Soc. Amer., June 1965, 37(6), 1102-1109. (Medical Physics Dept., University of Nijmegen, Nijmegen, The Netherlands).

The detection model is used to describe the detection of scarcely discernible noiseless signals by human Os. Detection is hampered by an internal noise generated by the sensory system itself. In the present study, it appears that increments of loudness of a tone and increments of intensity of a light can be detected independently and simultaneously. Here, the internal noise is specific for the system responsible for this detection. On the other hand, detection of an increment in duration of visual and auditory signals is completely correlated. This correlation and the similarity of the detectability of the 2 kinds of signals indicate that a "duration center" exists, serving to estimate the duration of both visual and auditory signals. The methods developed are useful for identification of separate or common parts of sensory systems.

R 8

25,912

Plomp, R. DETECTABILITY THRESHOLD FOR COMBINATION TONES. J. Acoust. Soc. Amer., June 1965, 37(6), 110-1123. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

Experiments were performed on the detectability threshold for combination tones, defined as the sensation level of primary tones for which combination tones become audible. Investigated were: a) detectability threshold for  $h-l$  with  $(h-l) < (h+l)$ , where  $h$  and  $l$  are the frequencies of the higher and lower primary tone, respectively; b) detectability threshold for 200, 400, & 600 cps with 800 + 1000 and 800 + 1400 cps as primary tones; c) audibility of combination tones for  $l=1000$  cps and  $h$  variable between 1000 & 3000 cps; d) detectability threshold for the "missing fundamental" of  $\cos 2\pi f t$ , with  $f$  varying from 125 to 1000 cps. From the experimental data, we may conclude that: a) there are large individual differences in the minimum sensation level of primary tones for which combination tones appear; b) for usual listening levels of speech and music, the ear's distortion is sufficiently low to avoid audible combination tones; c) the same holds for the "missing fundamental", so the fact that the pitch of a complex tone without fundamental is equal to the pitch of this tone cannot be explained by the assumption that the fundamental tone is reintroduced in the listener's ear; d) the fact that the detectability thresholds for combination tones are significantly lower for small than for large tone intervals indicates that, for both cases, the ear's distortion cannot be represented by the same nonlinear characteristic and supports the evidence that the tones are produced in the inner ear.

R 55

25,913

Schoeffler, M.S. THEORY FOR PSYCHOPHYSICAL LEARNING. J. Acoust. Soc. Amer., June 1965, 37(6), 1124-1133. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

A model for psychophysical learning is constructed by imposing some conditioning principles on concepts derived from the theory of signal detectability. The effects of a priori probability, feedback, and practice are derived in part by Monte Carlo simulation and in part by analysis. The theory makes some novel predictions for the effects of these variables, all of which find support in the literature. Some theoretical results are: a) performance improves with practice; b) feedback can be detrimental to performance in a psychophysical task; c) when the a priori probabilities of the stimuli are unequal and feedback is provided, the response criterion moves in the direction of optimality, but does not move far enough to reach optimality; however, when no feedback is provided, the criterion moves in the opposite direction.

R 20

25,914

Vigran, E. LOUDNESS CHANGE OF PURE TONES WITH CONTRALATERAL NOISE STIMULATION. J. Acoust. Soc. Amer., June 1965, 37(6), 1134-1138. (Physics Institute, University of Oslo, Oslo, Norway).

Loudness change of pure tones is measured with contralateral stimulation of narrow-band noise. A "paired comparison" method was used, and an increase in loudness was found at tone SPL 80 db in the applied frequency interval 300-1500 cps. The contralateral stimulus was 1/3-oct white noise with center frequency 2500 cps. A maximum loudness increase corresponding to 7-8 db in SPL was found with noise SPL 100 db. It is assumed that the measured effect can be due to the middle-ear muscle reflex, but must be explained in terms of central interaction.

R 8

25,915

Gold, B. TECHNIQUES FOR SPEECH BANDWIDTH COMPRESSION USING COMBINATIONS OF CHANNEL VOCODERS AND FORMANT VOCODERS. J. Acoust. Soc. Amer., July 1965, 38(1), 2-10. (Lincoln Lab., Massachusetts Institute of Technology, Lexington, Mass.).

Both channel vocoders and formant vocoders have often been used as bandwidth-compression devices. This paper explores several configurations wherein elements of both are combined into a single system. Frameworks are proposed within which the element forms can be systematically changed. Experimental results from several specific cases are discussed. Most significant of these is the comparison between an 11-parameter system presented in this paper and a 16-channel laboratory vocoder. The quality obtained from the 2 systems was comparable, indicating that data-rate savings are possible with the new configuration.

R 14

25,916

Sidley, N.A., Winograd, E. & Bedarf, E.W. STIMULUS-IDENTIFICATION OVERLAP IN LEARNING TO IDENTIFY COMPLEX SOUNDS. J. Acoust. Soc. Amer., July 1965, 38(1), 11-13. (Honeywell Incorporated, St. Paul, Minn.).

With a feedback method, 2 groups were taught to identify, by label, complex sounds. 1 group (10 Ss) continued to hear the sound following response and during identification; the second group (10 Ss) experienced a 1-sec delay between the sound and its label. Better learning and long-term retention characterized the group for which sound and label overlapped. The difference in learning between the 2 groups seems to support the hypothesis of a steep-decay function for auditory stimuli; i.e., the inferiority of Group II is caused by loss of a good part of the stimulus in the 1-sec. interval between the sound pattern and its identification.

R 9

25,917

Brown, A.E. MEASUREMENT OF AUDITORY THRESHOLDS. J. Acoust. Soc. Amer., July 1965, 38(1), 86-92. (Lockheed Research Laboratories, Palo Alto, Calif.).

2 systems of measuring auditory masking thresholds by statistical psychophysical techniques are developed. The first is a succession of free-choice tests with a different level of presentation fixed for each test. In the second, the presentation level is automatically adjusted and maintained at a level close to threshold. Scoring of the 2 tests is developed and their interrelation is discussed. The customary use of ROC (receiver operating characteristics) notations in this type of psychophysical testing can be augmented to provide a more comprehensive measure of the over-all performance of a test S. The term  $d'$ , developed by Tanner, Swets, & Green, provides a measure of the system under test to perform as an ideal receiver. This notation is augmented by a decision term  $D$ , which relates to the placement of the Ss' decision criterion and is independent of  $d'$ . When taken together,  $d'$  and  $D$  define the response of the S and show the effect of environmental changes. Alterations in environment produce changes in test results. These changes are assessed in terms of  $d'$  and  $D$ , showing how it is possible to provide a sensitive psychophysical measure of environmental effects.

R 9

25,918

Colburn, H.S. & Durlach, N.I. TIME-INTENSITY RELATIONS IN BINAURAL UNMASKING. J. Acoust. Soc. Amer., July 1965, 38(1), 93-103. (Electronics Research Lab., Massachusetts Institute of Technology, Cambridge, Mass.).

The principal results obtained in this study can be summarized briefly as follows: a) data were obtained on the variations in the binaural-masked threshold of a 500-cps tone masked by random noise as a function of simultaneous shifts in the interaural amplitude ratio and interaural time delay of the tone; b) for the parameter values tested, the predictions of the EC (equalization and correlation) model (including the symmetry prediction) are correct within experimental error; c) when the binaural unmasking results are interpreted in terms of time-intensity trade, the curves obtained bear no simple relation to those obtained when the time-intensity trade is based on lateralization; d) to clarify the relation of binaural-masked lateralization.

R 16

25,930

Thurlow, W.R., Marten, Anita E. & Bhatt, Bhachandra L. LOCALIZATION AFTEREFFECTS WITH PULSE-TONE AND PULSE-PULSE STIMULI. J. Acoust. Soc. Amer., May 1965, 37(5), 837-842. (University of Wisconsin, Madison, Wisc.).

When a pulse is presented from 1 position in space near in time to the beginning of a tone burst coming from another position in space, the tone burst may be perceived to be displaced toward the pulse. Measurements of displacement effects are given for various angles of separation of sources and duration of tone. A related type of displacement effect occurs that involves the perceived displacement of 1 pulse toward another in space when the 2 pulses are presented with small time separations between them. Another type of effect has been discovered, more closely related to von Békésy's concept of funneling, in which a pulse appears to be funneled into the spatial location of another that precedes or follows it by a small time interval. A "place" model is presented to help to explain these effects.

R 11

25,931

Verrillo, R.T. TEMPORAL SUMMATION IN VIBROTACTILE SENSITIVITY. J. Acoust. Soc. Amer., May 1965, 37(5), 843-846. (Sensory Communication Lab., Syracuse University, Syracuse, N.Y.).

Vibrotactile thresholds were determined for a number of temporal patterns of short pulses and for 3 frequencies of sine-wave signals in order to test Zwischlocki's theory of temporal summation. Experimental results showed that the theory accurately predicts the threshold shift as a function of pulse repetition rates, the number of pulses, and the burst duration of sinusoidal signals. They are also consistent with earlier auditory findings that the threshold shift as a function of burst duration is independent of frequency. It is concluded, therefore, that the theory of temporal summation adequately describes the functional relationship between the absolute vibrotactile threshold and various temporal patterns of the physical stimulus. The data also support a hypothesis resulting from earlier experiments that glabrous skin contains at least 2 receptor systems sensitive to mechanical stimulation.

R 18

25,932

Watters, B.G. IMPACT-NOISE CHARACTERISTICS OF FEMALE HARD-HEELED FOOT TRAFFIC. J. Acoust. Soc. Amer., April 1965, 37(4), 619-630. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

It has been said that the ISO tapping machine does not yield data on representative flooring materials that accurately relate to the impact-noise isolation provided for real, foot-fall impacts. To understand this problem, we have measured the impact force under both the ISO hammer and a woman's shoe heel. The hammer force is found to be much more intense and generally to contain more high-frequency components than the heel force. The differences between hammer and heel forces are found to arise from the different mechanical internal admittances and from the different approach velocities. Radiated sound levels for the measured force spectra applied to a concrete slab are calculated and found to agree closely with measured impact sound levels. We conclude that the ISO machine grossly misrepresents the impact isolation provided by some typical floor surfaces.

R 13

25,933

Dirks, D.D. & Malmquist, Carolyn. SHIFTS IN AIR-CONDUCTION THRESHOLDS PRODUCED BY PULSED AND CONTINUOUS CONTRALATERAL MASKING. J. Acoust. Soc. Amer., April 1965, 37(4), 631-637. (Health Sciences Center, University of California, Los Angeles, Calif.).

In the present investigations, auditory threshold shifts for either constant or pulsed pure tones were observed while a steady or pulsed narrow band of white noise was delivered to the contralateral ear via an insert receiver. The narrow-band masker, centered around 4000 cps, was presented at intensity levels of 50, 70, & 90 db SPL while thresholds were obtained from the test ear at 4000, 1000, & 250 cps. The results demonstrate, first, that larger threshold shifts occur when the test signal and the masker are pulsed simultaneously than when the masker is continuous; second, that a continuous masker may be as effective as the pulsed masker if the test tone is also continuous; third, that more contralateral masking is found when the test tone and masker are close in frequency; and, last, that a small increase in the average threshold shift occurs as the intensity level of the masker increases. Several interpretations are offered in explanation of the threshold shifts for the continuous-continuous and pulsed-pulsed (simultaneous) conditions.

R 11

25,934

Weston, P.B. & Miller, J.D. USE OF NOISE TO ELIMINATE ONE EAR FROM MASKING EXPERIMENTS. J. Acoust. Soc. Amer., April 1965, 37(4), 638-646. (Central Institute for the Deaf, St. Louis, Mo.).

To evaluate the possibility that 1 ear can be eliminated from a masking experiment by use of noise, certain relevant facts were determined. These are: a) if a tonal signal mixed with noise is received at 1 ear, the addition of a noise to the other ear slightly reduces the threshold for the tone if the noises are statistically independent; b) in contrast, the noise added to the nonsignal ear distinctly reduces the threshold for the tone if the noises are perfectly correlated (+1.0); c) these effects, (a) & (b) above, are observed whether the level of the masking noise at the ear that receives the tonal signal is less than, equal to, or greater than the level of the added noise at the ear that does not receive the tone; d) if identical tones are presented to the 2 ears and if the signal-to-noise ratio is about 25 db lower in 1 ear than in the other, the effect of the signal at the ear with the lower signal-to-noise ratio is eliminated from the masking experiment.

R 15

25,935

Zwicker, E. TEMPORAL EFFECTS IN SIMULTANEOUS MASKING BY WHITE-NOISE BURSTS. J. Acoust. Soc. Amer., April 1965, 37(4), 653-663. (Institute für Nachrichtentechnik, Stuttgart, West Germany).

The motivation of the research described was to investigate the behavior of a masking transient that indicates that masking of a short signal pulse by a longer white-noise burst is stronger at the beginning of the masker burst than later. The threshold of signal pulses masked by masker bursts was measured as a function of different variables such as bandwidth and center frequency of the signal, delay between onset of masker and onset of signal duration of signal and masker, level of masker, and repetition rate. The results reveal very little "overshoot" of the threshold of short pulses as a function of the ON time of the masker if the signal and the masker have the same or similar broad spectra. The overshoot increases up to 13 db as the bandwidth of the signal decreases down to that of a tone. The size of the "overshoot" and the prior excitation seem to be related to each other. Taking this in account, the thresholds under different conditions can be calculated on the basis of detection models. The measured and the calculated values are in good agreement.

R 11

25,936

Webster, J.C. SPEECH COMMUNICATIONS AS LIMITED BY AMBIENT NOISE. J. Acoust. Soc. Amer., April 1965, 37(4), 692-699. (USN Electronics Lab., San Diego, Calif.).

Speech intelligibility scores as a function of noise level are studied for face-to-face, sound-powered-phone, and amplified speech- (earphone and loudspeaker) communication conditions. The speech-interference level (SIL) for octaves of noise centered at 500, 1000, & 2000 cps (0.5/1/2) is used as the measure of noise level. By using this noise measure, much of the work in this field can be brought together and interpreted. It is noted that "noisy" and "very noisy" spaces are associated with SIL's such that "shouting" or "very loud" voice levels (or 95 db speech levels) are required for conversations at 1.5 or 3 ft, and this is the region where telephone conversations are judged to be "difficult" or "unsatisfactory". All of these adverse noise conditions occur at the region where ear protection will aid intelligibility and at the boundary where ear protection should be used to protect against hearing losses. Where people must converse or communicate via some interior communication device, 0.5/1/2 SIL's above 70 db should be avoided. At 0.5/1/2 SIL's greater than 90 db, the wearing of hearing protection should be made mandatory and every noiseproofing technique (except a noise shield for the microphone) should be employed. At 0.5/1/2 SIL's above 100 db, every noiseproofing technique should be employed.

R 55

25,937

Campbell, R.A. FEEDBACK AND NOISE-SIGNAL DETECTION AT THREE PERFORMANCE LEVELS. J. Acoust. Soc. Amer., March 1965, 37(3), 434-438. (Western Reserve University, Cleveland, Ohio).

The effect of the presence or absence of feedback, or immediate positive reinforcement, was studied at 3 performance levels: 88%, 75%, & 62% correct. The BUDTIF (Block Up and Down, Two-Interval--Forced-choice) experimental procedure was utilized. Signal-to-noise ratios were varied in a 104-trial run (about 7 min.) so as to maintain the desired performance level. The noise was set to 35 db SL. 1 group of naive Ss was used; each S was presented 1 of the 6 conditions of performance level and feedback for 5 consecutive runs. Another group of experienced Ss was presented with all 6 conditions in each of 6 1-h sessions. Threshold signal-to-noise ratios, intrarun variability of levels utilized, the time per run, and inter-run variability were determined. No statistically significant and systematic effect of feedback was found.

R 5

25,938

Harris, J.D. HEARING LOSS TREND CURVES AND THE DAMAGE-RISK CRITERION IN DIESEL-ENGINEER ROOM PERSONNEL. J. Acoust. Soc. Amer., March 1965, 37(3), 444-452. (USN Submarine Medical Center, Groton, Conn.).

Several hundred young men were given careful audiometry before beginning duty in noise of 105-110 db SPL at 1 or more of the octaves 300-600, 600-1200, 1200-2400 cps. These men were then given the same audiometric examination at intervals up to 5 years. Less than 15% of ears had permanent threshold shifts (PTS) of more than 20 db at any frequency. Trend curves extrapolated over log time predict a median PTS of 8 db at 4 kc/sec for 10 years' exposure. The PTS actually found was thus 20 db less than predicted by the ASA Z-24 Committee report; the 4-kc/sec. TTS2 for an 8-h exposure to this noise was over 60 db; use of the 4-kc/sec. TTS2 index would thus vastly overpredict both the actual PTS of 8 db and the Z-24 Committee prediction of 22 db. Ear defenders as actually worn by this population reduce median PTS by no more than 5 db. It is concluded that a damage-risk criterion of 100 db SPL at any of the relevant octaves would be conservative, protecting at least 85% of young healthy ears from PTS of over 20 db at any frequency.

R 16

25,939

Carter, N.L. EFFECT OF REPETITION RATE ON THE LOUDNESS OF TRIANGULAR TRANSIENTS. J. Acoust. Soc. Amer., Feb. 1965, 37(2), 308-312. (Commonwealth Acoustic Labs., Sydney, New South Wales, Australia).

The loudness of triangular transients with 0.5 msec rise time and 1 msec duration is studied as a function of repetition rate in the range of repetition rates from 1 pps (pulse/sec) to 128 pps. It is found that for each doubling of the repetition rate a reduction of 3 db in peak level of the transients is required to maintain equal loudness.

R 14

25,940

Loeb, M., Fletcher, J.L. & Benson, R.W. SOME PRELIMINARY STUDIES OF TEMPORARY THRESHOLD SHIFT WITH AN ARC-DISCHARGE IMPULSE-NOISE GENERATOR. J. Acoust. Soc. Amer., Feb. 1965, 37(2), 313-318. (USA Medical Research Lab., Fort Knox, Ky.).

Preliminary studies with an arc-discharge (spark-gap) impulse-noise generator produced data not entirely in line with previous experiments (employing longer pulses) with respect to the effects of variation of number and spacing of pulses and of preactivation of the acoustic reflex on temporary threshold shift (TTS). Specifically, growth of TTS with number of pulses was not linear but was less than logarithmic, and moderately loud sounds before each pulse, presumably intense enough to activate the reflex, were ineffective in reducing TTS. On the other hand, when an equal number of impulses were presented at a fast repetition rate, or when more intense activating stimuli were presented at a slow pulse-repetition rate, less TTS was observed. The TTS observed was greatest at high frequencies, especially at 6000 cps and above.

R 12

25,941

Toole, F.E. & Sayers, B.McA. LATERALIZATION JUDGMENTS AND THE NATURE OF BINAURAL ACOUSTIC IMAGES. J. Acoust. Soc. Amer., Feb. 1965, 37(2), 319-324. (Electrical Engineering Dept., Imperial College, London, England).

Lateralization-judgment trajectories with interaural time delay of acoustic images arising binaurally are reported for certain multicomponent signals such as multiple tones and repetitive transients. It is shown that certain multiple sound images simultaneously perceived may be independently lateralized and the characteristic judgment trajectories manipulated predictably in various ways. With repetitive binaural transients, the dominant, impulsive, image is shown to be accompanied by tonal images due to harmonics but it is argued that the impulsive image does not arise as a synthesis of the harmonic tonal images. High- and low-pitched impulsive images appear to be related to individual acoustic transients and apparently arise by virtue of neural activity in 2 different regions of the cochlea.

R 6

25,942

Nieder, P.C. & Creelman, C.D. CENTRAL PERIODICITY PITCH. *J. Acoust. Soc. Amer.*, Jan. 1965, 37(1), 136-138. (Research Center, Subcommittee on Noise, Los Angeles, Calif.).

Perceptual phenomena are reported that are observed when interrupted noise is presented to 1 ear and either correlated or uncorrelated continuous noise is presented contralaterally. Also described are effects observed when the contralateral stimulus is also interrupted noise. These and related results support the conclusion that there exists a central mechanism for the perception of periodicity pitch and require that existing models of central neural processes of pitch perception and binaural fusion be modified.

R 6

25,943

Guttman, N. BINUARAL INTERACTIONS OF THREE CLICKS. *J. Acoust. Soc. Amer.*, Jan. 1965, 37(1), 145-150. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Listeners tracked the trajectories of auditory images produced by a group of 3 clicks, of which 2 were temporally fixed in opposite ears and the 3rd ranged freely in time. The fixed clicks were positioned in 3 time- and level-difference combinations to produce a centered image. The results indicate that the temporally variable click interferes with the fixed-clicks image when it leads or lags by as much as approximately 25 msec. The leading interference is plausible explained by monaural forward masking, but the lagging interference is puzzling, partly because it seems inconsistent with results of other experiments in which the 2 fixed clicks are in 1 ear and the variable click is in the other. It was also found that the variable click leading by 5 msec or less completely governs lateralization. It was concluded that monaural forward masking obstructs determination of complex binaural interactions.

R 14

25,944

House, A.S., Williams, C.E., Hecker, M.H.L. & Kryter, K.D. ARTICULATION-TESTING METHODS: CONSONANTAL DIFFERENTIATION WITH A CLOSED-RESPONSE SET. *J. Acoust. Soc. Amer.*, Jan. 1965, 37(1), 158-166. (Purdue University, Lafayette, Ind.).

The development and evaluation of a new speech-intelligibility test suitable for routine use by operational personnel in determining the performance level of speech-communication systems is described. The format used is similar to that described for a rhyme test but makes use of a closed-response set. An experiment was performed to determine the general reliability of the test materials when administered to US Air Force enlisted personnel under a wide range of signal-to-noise ratios. Testing of 18 listeners over a period of 30 days showed that repeated exposure to the materials did not change the levels of average response in any appreciable way. Analysis of the responses to individual phonetic elements shows that the test can be useful for diagnostic study as well as for over-all evaluation of communication systems. Talker differences that appeared during the experiment and the statistical reliability and sensitivity of the materials are analyzed and discussed.

R 24

25,945

Thompson, L.W. & Thompson, Vaida D. COMPARISON OF EEG CHANGES IN LEARNING AND OVERLEARNING OF NONSENSE SYLLABLES. *Psychol. Rep.*, April 1965, 16(2), 339-344. (Medical Center, Duke University, Durham, N.C.).

A comparison between EEG changes occurring during learning and overlearning of nonsense syllables was made, with emphasis on activity related to occasional errors of well-learned material. 17 college students learned 12 nonsense syllables by the serial anticipation method, followed by 20 trials of overlearning. EEGs were recorded simultaneously and analyzed by a Burch Period Analyzer. Increased fast and decreased alpha activity were observed during learning. During overlearning, tracings returned toward control levels. Activity associated with errors during overlearning showed a marked increase in fast and decrease in alpha comparable to the changes noted in earlier stages of learning. The data are discussed in terms of the functional significance of the reticular system.

R 12

25,946

Butler, D.C. & Miller, N. "POWER TO REINFORCE" AS A DETERMINANT OF COMMUNICATION. *Psychol. Rep.*, June 1965, 16(3)Part 1, 705-709. (San Fernando Valley State College, Northridge, Calif. & Yale University, New Haven, Conn.).

"Power to reinforce" was defined as the conditional probability of completing an attempt to reward another person and was manipulated by controlling the content of messages without the knowledge of the sender. To explore its effects on communication, 5 different group patterns of power were investigated. 5-man groups passed 100 messages at a fixed rate in a Bavelas apparatus with all channels open. Ss were free only to choose to whom to send a message. The source of messages received was identified by color. In all structures the frequency of messages received increased monotonically with the receiver's power to reinforce.

R 10

25,947

Stern, G.S., Lana, R.E. & Pauling, F.J. FEAR AROUSAL AND ORDER OF PRESENTATION OF PERSUASIVE COMMUNICATIONS. *Psychol. Rep.*, June 1965, 16(3)Part 1, 789-795. (Alfred University, Alfred, N.Y.).

94 Ss were exposed to various combinations of fear-arousing and neutral communications concerning the effects of smoking. Measures of anxiety and self-esteem were taken on all Ss with the IPAT Self-analysis Form and the Janis and Field Personality Questionnaire, respectively. Ss were then formed into high and low anxiety and self-esteem groups. Of 24 predicted directions of opinion change, 23 were realized although only 11 were statistically significant. These results were predicted from a fear-reduction interpretation of personality as affecting the susceptibility to persuasion in the situation where opposed communications on the same topic are utilized.

R 8



25,948

Rohman, N.L. & Jahnke, J.C. EFFECT OF RECALL CONDITION PRESENTATION RATE AND RETENTION INTERVAL ON SHORT-TERM MEMORY. Psychol. Rep., June 1965, 16(3)Part 1, 877-883. (Miami University, Oxford, Ohio).

A total of 300 university students were presented a brief list of non-alphanumeric items and instructed to recall immediately either the items (free recall, FR), the order in which the items were presented (order recall, OR), or both (serial recall, SR). Presentation rate and retention interval were additional experimental variables in Exp. I & II, respectively. In both experiments significant differences in recall were found between FR conditions and the remaining 2, which did not differ from each other. More items were recalled at the slow than fast rate. Retention interval was not a significant variable. Results suggest that retention will improve when order information is eliminated from recall (Brown, 1958), that the recall of item and order information involve at least partially independent memory processes, and that, while the recall of items may proceed independently of the recall of their order, the converse is not true.

25,949

Harcum, E.R. & Coppage, E.W. SERIAL-POSITION CURVE OF VERBAL LEARNING AFTER PROLONGED PRACTICE. Psychol. Rep., Oct. 1965, 17(2), 475-488. (College of William & Mary, Williamsburg, Va.).

This study investigated the effect of prolonged practice on the serial-position curve of learning. 13 Ss learned to a criterion of 2 perfect recitations by the anticipation method 12 different serial lists of 10 nonsense syllables, 1 list being learned each day. The hypothesis was that the skewness of the serial-position curve is produced by the S's span of immediate memory. The prediction was that an increase in the memory span due to practice would cause an increase in the skewness of the serial-position curve. The skewness of the serial-position curve did increase with practice as predicted, but internal relations in the data implied a causal mechanism which was unrelated to memory span. Instead, Ss improved in the use of a strategy which employed the first serial item as an anchor item for directing learning.

R 17

25,950

Blumenfeld, W.S. PERCEIVED IMPORTANCE AND OBTAINABILITY OF CERTAIN VALUES ASSOCIATED WITH NAVAL SERVICE. Psychol. Rep., Oct. 1965, 17(2), 603-606. (USN Personnel Research Field Activity, Bureau of Naval Personnel, San Diego, Calif.).

A personnel turnover hypothesis involving the congruity of values between the individual and the institution was examined in 2 samples of reenlisted electronics personnel in the Navy. Each sample rated 10 values generally associated with naval service in terms of the importance of the values to them and the obtainability of the values in the Navy. In both samples, the ratings were highly reliable; and certain of the values were rated significantly higher than others. In both samples, the relationship between perceived importance and obtainability was essentially zero. The data neither refuted nor supported the original hypothesis; methodological considerations were discussed.

R 3

25,951

Driscoll, J.M. & Lanzetta, J.T. EFFECTS OF TWO SOURCES OF UNCERTAINTY IN DECISION MAKING. Psychol. Rep., Oct. 1965, 17(2), 635-648. (Dartmouth College, Hanover, N.H.).

The effects of variation in the stimulus and response uncertainty of a decision task on the decision maker's subjective uncertainty, amount of information search, and information processing were examined. Results indicated that: a) information search tended to continue until 1 bit of stimulus and/or response uncertainty remained, independent of the level of initial uncertainty; b) the higher the stimulus uncertainty of the decision task, the faster S began seeking information; and c) subjective uncertainty increased with both stimulus and response uncertainty. Unfortunately, the data precluded adequate examination of the possible relationship between subjective uncertainty and search behavior, but the latency of search was negatively correlated with the magnitude of subjective uncertainty across Ss, suggesting that a more extensive examination of the motivational effects of subjective uncertainty would be of value.

25,952

Brown, W.P. THE YERKES-DODSON LAW REPEALED. Psychol. Rep., Oct. 1965, 17(2), 663-666. (University of Aberdeen, Aberdeen Scotland).

The author initially evaluates the evidence cited in support of the Yerkes-Dodson Law which generally states that the optimum motivation for a learning task decreases with increasing difficulty. He concludes that none of the experiments provide convincing evidence of the validity of this generalization. (HEIAS)

R 12

25,953

Streufert, S., Clardy, M.A., Driver, M.J., Karlins, M., et al. A TACTICAL GAME FOR THE ANALYSIS OF COMPLEX DECISION MAKING IN INDIVIDUALS AND GROUPS. Psychol. Rep., Dec. 1965, 17(3), 723-729. (Rutgers State University, New Brunswick, N.J.).

An experimental simulation is described as a prototype for research concerned with the analysis of human information processing characteristics in complex environments. The method employs a simulated war game environment which lends itself to the analysis of performance and perceptual characteristics of individuals and social groups. Suggestion for procedures, space requirements and measurement techniques are included.

R 10

25,954

Jakobovits, L.A. REPETITION OF AUDITORILY PRESENTED INFORMATION. *Psychol. Rep.*, Dec. 1965, 17(3), 785-786. (University of Illinois, Urbana, Ill.).

Independent groups of Ss received various amounts of repetition (2, 4, 8, & 16 presentations) of a message played back on a tape recorder. Half of the Ss had an intentional listening set with respect to recall of information given in the message, and the other half of the Ss had an incidental learning set. Recall scores indexed by 8 difficult and 8 easy items of an objective questionnaire were subjected to analyses of variance which showed that repetition does not automatically improve recall, but that the latter is a function of the difficulty of the information given and the learning attitude of the listeners.

R 2

25,955

Hawkins, C.K. & Lanzetta, J.T. UNCERTAINTY, IMPORTANCE, AND AROUSAL AS DETERMINANTS OF PRE-DECISIONAL INFORMATION SEARCH. *Psychol. Rep.*, Dec. 1965, 17(3), 791-800. (US Veterans Administration Hospital, Perry Point, Md. & Dartmouth College, Hanover, N.H.).

Berlyne's conflict theory of "epistemic curiosity" assumes information search to be elicited by arousal resulting from response conflict, which in turn is a function of the uncertainty and "importance" of a choice. Several predictions derived from this formulation were tested using a choice task in which uncertainty (number of alternatives) and importance (value of outcomes) were manipulated and S's GSR was recorded. Results showed that: a) neither variable influenced arousal; b) increasing the uncertainty component of conflict increased search; increasing importance suppressed it; c) arousal did not increase before a search response, but Ss whose general arousal levels were high searched more.

R 13

25,956

Sheppard, J.J. & Gross, J.F. SOME RELATIONSHIPS BETWEEN THE AVERAGE ENERGY OF THE QUANTA IN A VISUAL STIMULUS AND THE COLOR RESPONSE. TT 66 60261, Rep. P 3230 1, Sept. 1965, 27pp. Rand Corporation, Santa Monica, Calif. (Transl. from: *Vision Research*, 1965, 5, 361-377. (AD 626436))

It is shown that the ratio of the number of light quanta absorbed by the retina to the absorbed light energy is an important parameter in the elaboration of colour information by the visual sense. For this ratio, thus the number of quanta absorbed per unit of absorbed energy, we have introduced the term "specific quantum number" (SQN). By measuring the SQN for various spectral regions we can show, on the basis of Grassmann's laws, that all light stimuli which occupy the same locus in colour space, independently of their colour composition (metamers), also have equal SQN's. The colour loci, for equal SQN in the colour triangle, lie along lines which coincide exactly with the tritanopic colour confusion lines. One component of the colour discriminating function of the visual sense derives from the ability to gauge differences in the specific quantum number. With the help of a simple model, we can qualitatively describe the dependency of opponent-colour experience upon receptor excitation.

R 11

25,957

Stern, R.M. EFFECTS OF CONTRAST IN STIMULATION ON GASTROINTESTINAL MOTILITY. *Psychol. Rep.*, Feb. 1965, 16(1), 156-158. (Indiana University, Bloomington, Ind.).

The purpose of this study was to determine the effects of contrast in stimulation, or in other words, the effects of the immediately preceding level of stimulation on the gastrointestinal response to a moderate level of stimulation. As was hypothesized, a change to a moderate level of stimulation resulted in a decrease in g.i. motility for a group of 20 male Ss who were responding at a high level to high stimulation, and an increase in level of responding for another group of 20 male Ss who were responding at a previously low level to low stimulation. For various autonomic measures there is an immediate reversal in relative level of responding with change in level of stimulation, whereas for g.i. motility there is a 2- to 3-min. increase in activity for both groups following any change in stimulation and then a reversal in level of g.i. responding.

R 3

25,958

Wolin, B.R., Weichel, Rosemarie, Terebinski, S.J. & Hansford, E.A. PERFORMANCE ON COMPLEXLY PATTERNED BINARY EVENT SEQUENCES. *Psychol. Monogr.*, 1965, 79(7), 1-18. (System Development Corporation, Santa Monica, Calif.).

Prediction behavior was studied in a context of complexly patterned binary sequences. Sequences were generated from nonstationary, event-contingent, partially random sources. A variable of major importance was the presence or absence of a displayed history of the last 8 events in the sequence. Evidence was found that people seek and find order to some degree in the environment. The process by which order is sought and found is discussed. Briefly, Ss do not attempt to analyze the sequence formally, but they respond to recurrent patterns. Those sources where relations between events were important were much more difficult to learn than were sheer frequency or location, and not relations, were important.

R 19

25,959

Schiff, W. PERCEPTION OF IMPENDING COLLISION. *Psychol. Monogr.*, 1965, 79(11), 1-26. (New York City College, New York, N.Y.).

Theoretical issues and empirical evidence concerned with the perception and avoidance of impending collision were discussed. A theoretical framework was developed, based on J.J. Gibson's concepts of ecological optics and stimulus information. A series of experiments was performed with invertebrate and vertebrate Ss; several stimulus variables were manipulated, and several hypotheses derived from the theoretical framework were tested. It was found that most animals respond avoidantly and directionally to the abstract visual stimulus property of accelerated magnification of a dark form in the field of view, which specifies the approach of an object and impending collision. Such behavior was found to be relatively independent of shape and magnification rate (with some exceptions) and is apparently not a product of associative learning in some species.

R 45

25,960

Underwood, B.J. & Erlebach, Adrienne H. STUDIES OF CODING IN VERBAL LEARNING. Psychol. Monogr., 1965, 79(13), 1-25. (Northwestern University, Evanston, Ill.).

6 experiments are reported in which free learning (FL) and paired-associate learning (PAL) were examined with respect to the effects of coding of verbal units on learning. In 2 FL experiments and 1 PAL experiment where response terms were manipulated, encoding of trigrams to words produced a more meaningful unit. Such encoding was shown to influence learning positively only if decoding was simple. Encoding of a stimulus term to a word was also shown to influence learning positively, but such encoding did not occur unless the possibilities were easily perceived. Finally, an experiment demonstrated sound coding of response terms, but the positive effect on transfer was small and limited to unmixed lists. We concluded that coding systems: a) may influence learning positively if decoding is simple; b) will produce only a small positive effect even under favorable conditions; c) may have no positive effect even if used and may, under certain conditions, inhibit learning.  
R 11

25,961

Novak, S. THE EFFECT OF ELECTRODUTANEUS DIGITAL STIMULATION ON THE DETECTION OF SINGLE AND DOUBLE FLASHES OF LIGHT. Psychol. Monogr., 1965, 79(15), 1-19. (Columbia University, New York, N.Y.).

2 brief flashes separated by a dark interval were presented successively to the same foveal locus of O's dark-adapted right eye. Stimulus values were chosen to obtain a report of 2 events 80% of the time. A marked decrease in temporal resolution occurred when a brief shock was delivered to O's ipsilateral hand 25 msec before either of the flashes. In addition, a similarly presented brief shock was found to lower the luminance required for absolute threshold of a single flash. Based on this finding, a brightness enhancement "masking" hypothesis was advanced to explain the effect of the shock on the temporal resolution of the flashes. Data from subsequent experiments were not consistent with this hypothesis. Additional experiments demonstrated that the amount of reduction in the temporal resolution of the flashes was not a function of shock intensity. Other directions of explanation based on signal detection theory and neurophysiological "alerting" data are examined and are also found inadequate to encompass the present data.  
R 15

25,962

Suedfeld, P. & Vernon, J. STRESS AND VERBAL ORIGINALITY IN SENSORY DEPRIVATION. Psychol. Rec., Oct. 1965, 15(4), 567-570. (Rutgers University, New Brunswick, N.J. & Princeton University, Princeton, N.J.).

No relationship was found between degree of stress experienced by 14 sensory deprivation Ss and changes in verbal originality. The consideration of previous research and of a pilot study indicates that a curvilinear function may accurately describe the correlation between originality and a greater range of stress levels.  
R 14

25,963

Olson, R.S., Diehm, D.F. & Elfner, L.F. SOME FACTORS AFFECTING THE PERCEPTION OF VERTICALITY. Psychol. Rec., Jan. 1965, 15(1), 51-55. (Kent State University, Kent, Ohio).

An experiment was performed to assess the effects of practice, set, sex and familiarity with the apparatus on the perception of verticality. The Ss were 50 men and 50 women, all undergraduates. A miniaturized rod and frame apparatus was used to obtain measures of error in the judgment of verticality. The experimental conditions were: a) no special instructions; b) familiarization with the apparatus before testing; c) instructions to induce set; d) practice sessions then testing; and e) set plus practice. Women produced more errors than men ( $p < .01$ ). Even with practice this difference is significant ( $p < .05$ ). Practice was the only other significant effect, with no interactions. An analysis of the practice sessions suggested that improvement was inhibited by the S's gradual adaptation to the "reality" of the tilted frame.  
R 10

25,964

Köhler, W. UNSOLVED PROBLEMS IN THE FIELD OF FIGURAL AFTER-EFFECTS. Psychol. Rec., Jan. 1965, 15(1), 63-83. (Dartmouth College, Hanover, N.H.).

The theory of figural after-effects developed by Wallach and Köhler is not always clearly understood. After a short description of the theory, some errors found in recent publications are therefore briefly corrected. Since this discussion shows that some aspects of the theory have so far not been formulated in sufficiently explicit terms, an improved presentation is then given, and used in the explanation of particularly important experimental findings. A list of facts to which the theory cannot yet be applied is added.  
R 40

25,965

Hardesty, D. & Bevan, W. RESPONSE LATENCY AS A FUNCTION OF THE TEMPORAL PATTERN OF STIMULATION. Psychol. Rec., July 1965, 15(3), 385-392. (Kansas State University, Manhattan, Kan.).

A set of 3 experiments, involving a total of 360 Ss, explored the relation between response latency in a simple vigilance task and the temporal pattern of stimuli presented for detection. The experimental paradigm was the one devised by Mowrer for his studies of the central locus of set. The data indicated response latency to vary as a function of the difference between the duration of the immediately preceding interstimulus interval and the average interstimulus interval used in the experimental order of presentation. This latter value is viewed as an internal referent similar to the adaptation level found to function in sensory judgments. Following Adaptation Level Theory the mean was determined to be the best estimate of this average.  
R 9

25,966

Zelkind, I. & Spilka, B. SOME TIME PERSPECTIVE--TIME PERCEPTION RELATIONSHIPS. *Psychol. Rec.*, July 1965, 15(3), 417-421. (University of Denver, Denver, Colo.).

This study represents an effort to relate two aspects of the psychological study of time previously treated as independent. 154 Ss judged the temporal length of a series of short 1000 cps signals. Time perception scores, the number of overestimations minus the number of accurate judgments and underestimations, were obtained over 26 trials. These measures were then correlated with the scores obtained on 5 scales of time perspective. The extension, density, directionality, coherence, and valence of future time were thus assessed. 3 of the 5 perspective scales correlated positively with overestimation of the time intervals, supporting the hypothesis that time perception overestimation would relate to future time perspectives.

R 13

25,967

McGavren, Musetta. MEMORY OF BRIEF AUDITORY DURATIONS IN COMPARISON DISCRIMINATIONS. *Psychol. Rec.*, April 1965, 15(2), 249-260. (Neurosensory Center & Psychology Dept., State University of Iowa, Ames, Iowa).

The effect of varying intervals of delay between the presentation of a standard and a comparison auditory stimulus was investigated. The hypothesis that an optimal interval for making comparison judgments would have to be long enough to allow identification of the first stimulus was supported. Ss who performed most poorly tended to require a longer intra-pair interval for their optimal performance than did the group as a whole. Appreciably more errors were made by Ss when the comparison stimuli appeared first in the pair than when the standard stimulus was presented first. It was suggested that whatever had been remembered when the standard duration appeared first could be retained over an interval at least 12000 msec. in length and allow optimal comparison judgments of the two tones while no such "memory" for the comparison stimuli could be retained beyond the optimal interval of 1500 msec. The mechanism for this "memory" does not appear to be dependent upon rehearsal of the stimuli nor upon frequency of experience with them. No definitive support for a short-term storage mechanism is evident in these data. Suggestions were made as to which variables might be most useful in comparative studies of normal and brain-damaged Ss.

R 8

25,968

Madison, H.L. & Goodrich, G.L. COMPUTER PREPARATION OF EXPERIMENTAL DATA SHEETS. *Psychol. Rec.*, April 1965, 15(2), 297-298. (University of Wisconsin, Milwaukee, Wisc.).

The use of electronic digital computers for the preparation of data or tally sheets requiring the listing of random sequences of reinforcing or other experimental events is described. Error-free lists of random experimental events may be obtained quickly with a computer, printed in a form appropriate for E to record S's responses, at a considerable saving of E's time.

R 2

25,969

Mackay, D.M. VISUAL NOISE AS A TOOL OF RESEARCH. *J. gen. Psychol.*, April 1965, 72(Second Half), 181-197. (Communication Dept., University of Keele, Staffordshire, England).

The main purpose of this paper is to illustrate the usefulness of static and dynamic noise in revealing anomalies of visual-information processing. The following topics are discussed: I. Static visual noise: a) visual anomalies; b) linearity. II. Spatiotemporal dynamic noise: a) distinction between foveal and peripheral fields; b) monocular vs binocular viewing; c) effect of intensity; d) steady illumination in 1 eye; e) blank flashes; f) aftereffects of visual motion. III. Restriction of field: a) the frame-adhesion effect; b) effects of retinal-image displacement; c) other effects of frame motion; d) aftereffects of field occlusion; e) the omega effect. IV. Effects of patterned fields: a) complementary images; b) effects of a "pause" in noise; c) phi-effect with parallel linear patterns. V. Implications of the above. (HEIAS)

R 25

25,970

Smith, G.C. & Mauch, H.A. THE DEVELOPMENT OF A READING MACHINE FOR THE BLIND. Contract V 1005M 1943, June 1965, 41pp. Mauch Laboratories, Incorporated, Dayton, Ohio. (AD 470833)

This report discusses progress on the development of a personal type reading machine for the blind. The most advanced personal type reading machine being developed by Mauch Laboratories provides the blind user with a "spelled speech" equivalent for each upper and lower case letter or ligature scanned by a hand held optical probe. The character recognition technique recognizes most popular type fonts with moderate accuracy (90-95%) and speed (80-90 words per min) by using a special arrangement of photoconductors to gather information on letter features. The development of the hand held probe for this machine has resulted in a family of direct translation reading aids which are pocket sized and battery operated and may be used independently for low speed reading. These are the Visotactor A which may be used for recognition also, the Visotactor B, and Multicolumn Visotactor which are "tactile optophones" with one or more columns of photocells and associated stimulators, and the Visotoner which is a 9 tone self-contained optophone. One or more operating prototypes of each device (except the Multicolumn Visotactor which is still experimental) were completed.

25,971

Houston, J.P., Garskof, B.E. & Silber, D.E. THE INFORMATIONAL BASIS OF JUDGED COMPLEXITY. *J. gen. Psychol.*, April 1965, 72(Second Half), 277-284. (Psychology Dept., University of Michigan, Ann Arbor, Mich.).

The present study was designed to test the hypothesis that stimulus redundancy is an important determinant of judgments of stimulus complexity, and that the amount of physical change occurring within a stimulus is unrelated to its judged complexity. 36 Ss judged the complexity of strips of black and white squares, which varied systematically in terms of the 2 independent variables. The results indicate that both variables influence significantly judgments of stimulus complexity. Redundancy accounts for the greater portion of the variance. With 1 set of stimuli, a significant interaction between the effects of redundancy and change was found. It was suggested that these results have implications for the study of curiosity, exploratory, and manipulative behavior.

R 8

25,972

Shelly, M.W. & Shelly, Carolyn H. A STATISTICAL TREATMENT OF JUDGMENTS OF CURVE PROPERTIES. J. gen. Psychol., April 1965, 72(Second Half), 327-337. (USN Office of Naval Research, Washington, D.C.).

An experiment was conducted in which it was assumed that, in the perception of curves, certain parts of the curve receive more attention than others and that this tendency, interpreted as a sampling distribution, influences judgments concerning the average height of a curve. 3 test curves were used to determine how well hypothesized sampling distributions could predict the average judged height of the curve. 26 Ss were used. The photographed stimuli on a strip film were projected onto a screen in front of the Ss. In the projected image, 1 unit equalled about 3 in. The Ss were asked to estimate the average height of the curves to within 1/4 of a unit. Specifically, it was predicted that those portions of the figures sampled most heavily are those where the figure gives the appearance of greatest changes in contour. In general, these predictions are supported by the results obtained, but the quantitative predictions are not as accurate as desired. These errors in prediction may have been caused through the use of linear distribution functions or through treating the sampling on the 2 halves of a curve as independent.

R 14

25,973

Hadden, J.W. AN EXPLORATORY EXPERIMENT INTO THE PHYSIOLOGICAL BASIS OF SOUR TASTE. J. gen. Psychol., Oct. 1965, 73(Second Half), 307-316. (College of Physicians & Surgeons, Columbia University, New York, N.Y.).

To gain insight into the physiological basis of sour taste, a new gustometer compact (saliva-free and simple to apply) was devised; and 2 experiments were performed in which taste and nontaste areas of the tongue were compared in terms of reactivity to hydrochloric acid; a) In the first experiment, acid stimuli were applied to the side and top of tongue, and  $H^+$  ion loss into the tissue was measured. Loss occurred which was dependent on stimulus concentration and duration, but not on location; b) In the second experiment, acid stimuli were applied to the same areas, then a shift in equilibrium was induced, and return of  $H^+$  ions from the tissue was measured. Return occurred which was dependent on stimulus concentration, location, and duration. The top of the tongue returned more ions than did the taste-sensitive side; c) The results were analyzed in terms of a diffusion model. It was found that loss occurs at a rate 100 times faster than by simple diffusion. A reaction factor that includes both intracellular and extracellular processes can be defined to account for the facilitation of loss. The magnitude of return differences necessarily defines intracellular processes as the agents responsible for this difference; d) It is concluded that the location differences in return are the result of firmer intracellular binding and that such binding may be involved in the taste process.

R 9

25,974

Sweeney, D.R. THE EFFECT OF ANALGESIC AGENTS UPON THE LATENCY OF PRICKING PAIN. J. gen. Psychol., July 1965, 73(First Half), 13-19. (USA Research Institute of Environmental Medicine, Natick, Mass.).

2 dosage levels (32 and 56 mg) of codeine and dextro propoxyphene hydrochloride (Darvon) were administered, along with placebos, in a double-blind, randomized-conditions design, to 4 subjects trained to report accurately the latency of the pricking-pain sensation. Measurements were taken on a group of 22 spots placed on the volar surfaces of the forearms and each stimulated only once in a session and on one spot that was stimulated every 5 min. in a session. No analysis of these data supported a conclusion that the analgesics produced significant effects. The accuracy with which Ss were able to identify drug sessions by means of experienced side effects was generally low. The data showed that frequent stimulation of the same skin area led to a highly significant elevation in latency of the pricking-pain sensation. Without proper controls, such an effect could be interpreted as a result of analgesia produced by drugs.

R 10

25,975

Chapanis, A. "WORDS, WORDS, WORDS." Hum. Factors, Feb. 1965, 7(1), 1-17. (Psychology Dept., Johns Hopkins University, Baltimore, Md.).

The aim of this paper is to call to attention a very large and important area of human factors engineering that is almost entirely neglected. This area consists of the language and the words that are attached to the tools, machines, systems, and operations with which human factors engineers are concerned. Examples, illustrations, and data are cited to show that changes in the words used in man-machine systems may produce greater improvements in performance than human engineering changes in the machine itself. Arguments are made that this province--the language and words of machines--is properly the concern of the human factors engineer, and not of the grammarian, linguist, or the communication theorist. The paper concludes with an outline of some of the kinds of work that needs to be done to fill these important gaps in our knowledge and technology.

25,976

Fleishman, E.A. THE PREDICTION OF TOTAL TASK PERFORMANCE FROM PRIOR PRACTICE ON TASK COMPONENTS. Hum. Factors, Feb. 1965, 7(1), 18-27. (American Institutes for Research, Washington, D.C.).

204 Ss practiced the components of a complex multidimensional compensatory pursuit task, singly and in combination. These components involved discrete display-control relationships. The total task, which was practiced last, requires an integration of these components; that is, the S must operate the multiple controls in order to minimize error indications on all displays simultaneously. The problems investigated were: a) the extent to which performance on task components, individually practiced, is predictive of subsequent total task performance; b) the extent to which practice on combinations of components is predictive of total task performance; c) the interrelationships among component performances; and d) the relative contribution of various component performances to total and subtask performances. The resulting correlational and multiple correlational analyses provide some tentative principles of part-whole task relationships relevant to the understanding of skilled performance.

R 12

25,977

Rappaport, M. INCREASING VOICE COMMUNICATION CHANNELS USING MAN'S BINAURAL LISTENING CAPACITY. Hum. Factors, Feb. 1965, 7(1), 28-37. (Agnews State Hospital, San Jose, Calif.).

Sending voice messages over pairs of channels makes available more channels for communication than would be possible if channels were used in a conventional manner and only 1 message was sent over 1 channel. Although this means that all channels under the dual channel system must carry several messages simultaneously, it is shown that for Ss wearing earphones, message intelligibility remains remarkable higher than if the same number of messages are sent over a single channel. The superiority of the dual channel method is attributed primarily to the unique capability of the human ear-brain system to perceive diotic signals as being located in the center of the head while all dichotic signals are perceived as being off to the side of the head. Where 7 voices are talking simultaneously intelligibility of messages under the dual channel method of transmission is about 94% as compared to 11% under the single channel method. Practical implications of these findings for a number of military and civilian communication situations are discussed.

R 8

25,978

Thorpe, C.E. & Rowland, G.E. THE EFFECT OF "NATURAL" GROUPING OF NUMERALS ON SHORT TERM MEMORY. Hum. Factors, Feb. 1965, 7(1), 38-44. (Bell Telephone Laboratories, Inc., Holmdel, N.J. & Rowland & Company, Inc., Haddonfield, N.J.).

When individuals undertake to memorize long sequences of items, they show a strong tendency to break the sequences into smaller subgroups. This type of spontaneous grouping can be called "natural" grouping. 12 Ss were used. There were 6 experimental conditions as follows: 7-digit sequence, 8-digit sequence and 9-digit sequence with unlimited time to memorize and the same sequences with a limited time to memorize. This report reveals that certain specific grouping patterns are spontaneously utilized significantly more often than others for various particular sequence lengths. Furthermore, those persons who employ these "natural" grouping patterns obtain significantly better recall results. The most "natural" subgroup size was found to be 3 digits with 2 digits being the next most "natural". These findings should be useful for any application in which number codes are used (telephone numbers, license plates, stock numbers, etc.).

R 11

25,979

Soliday, S.M. & Schohan, B. TASK LOADING OF PILOTS IN SIMULATED LOW-ALTITUDE HIGH-SPEED FLIGHT. Hum. Factors, Feb. 1965, 7(1), 45-53. (Human Factors Group, North American Aviation Inc., Columbus, Ohio).

Experienced pilots flew simulated LAHS terrain-following missions under varying conditions of airspeed, type of terrain, navigation task loading, and emergency task loading. All flights were made under simulated medium-heavy turbulence conditions and all lasted 1 hr. System performance measurements were continually recorded, and pilot reaction times were measured in several situations during the flights. Average altitude maintained throughout the flights did not vary with any of the experimental conditions, but the pilots always flew too high going up terrain slopes and too low going down them. Deviations about the required clearance altitude increased with increasing airspeed and with increasing steepness of slopes, but were unaffected by navigation or emergency task procedures. Heading maintenance was equally good under all experimental conditions. Pilots' reaction times did not change under the different experimental conditions, indicating that they were equally alert and could perform physical and mental tasks equally well under all conditions. There was no evidence of fatigue under any condition.

R 8

25,980

Lincoln, R.S. & Cahill, H.E. DETECTING OUT-OF-TOLERANCE CONDITIONS WITH METER AND DIGITAL DISPLAYS. Hum. Factors, Feb. 1965, 7(1), 54-62. (Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif.).

4 experiments were conducted to determine the relative effectiveness of meter and digital displays currently used for checking the status of a missile's hydraulic control system. In all experiments, information was provided either on a configuration of 4 digital displays or on a similar configuration of 4 panel meters. The Ss' task was to determine the class of information being displayed (attitude response) and the condition of the hydraulic system with respect to established tolerance limits (tolerance response). The main conclusions were: a) the tolerance response was performed significantly faster with the digital displays; b) error rates for the 2 display panels were essentially equivalent on both the attitude and tolerance responses; c) Ss made significantly more errors in reporting an "in tolerance" condition when the display was "out-of-tolerance" than they made in reporting an "out-of-tolerance" condition when the display was "in tolerance." This bias was independent of the Ss' previous level of experience on similar tasks.

R 3

25,981

Clark, H.J. SPACE RENDEZVOUS USING VISUAL CUES ONLY. Hum. Factors, Feb. 1965, 7(1), 63-70. (USAF Aerospace Medical Research Labs., AFSC, Wright-Patterson AFB, Ohio).

7 trained Ss flew simulated short range coplanar orbital rendezvous maneuvers, using direct visual cues only. 2 rendezvous techniques were compared: line-of-sight and trajectory. In the former, the S could control up-down and fore-aft thrust only; in the latter, he could, in addition, control pitch. Using either technique, all Ss were able to maneuver successfully to a position 100 ft directly in front of the target at a terminal velocity of less than 5 ft/sec. Significantly less fuel was expended in performing the trajectory maneuver. The principal man-machine performance factors in the line-of-sight maneuver were tentatively described as the ability to conserve fuel used for longitudinal and vertical translation, the ability to conserve mission time, and the ability to proficiently close with the target. The principal factors for the trajectory maneuver were tentatively described as the ability to conserve fuel for longitudinal translation, the ability to conserve mission time, the ability to effectively apply longitudinal thrusts and conserve fuel used for vertical translation, and the ability to match the trajectory path of a minimum fuel two impulse maneuver.

R 6

25,982

Braunstein, M.L., Been, R.T. & Piazza, M.H. A RATING SCALE FOR DAMAGE EVALUATION. Hum. Factors, Feb. 1965, 7(1), 71-73. (Aviation Safety Engineering & Research Div., Flight Safety Foundation, Inc., Phoenix, Ariz.).

Accurate evaluation of the structural damage to an aircraft resulting from an accident is a necessary prerequisite to research relating aircraft damage to occupant injury. Damage evaluation cannot be related to a readily identifiable set of physical variables, but is highly dependent on the judgment of the individual O. The present study explores a means of standardizing these judgments, to provide more uniform evaluations for use in statistical analyses. An aircraft damage scale was constructed from a set of photographs of accident-involved aircraft by the Method of Equal Appearing Intervals. An experimental evaluation of the scale demonstrated its usefulness in increasing the reliability and accuracy of aircraft damage evaluations made from photographs. Other applications of this scaling technique are discussed.

R 10

25,983

Thackray, R.I. CORRELATES OF REACTION TIME TO STARTLE. Hum. Factors, Feb. 1965, 7(1), 74-80. (Experimental Psychiatry Institute, Pennsylvania Hospital, Philadelphia, Penn.).

The present study was concerned with behavioral and physiological correlates of response time to high intensity, "unexpected" auditory stimuli. Stimuli consisted of an initial 120 db startle tone followed by a series of 50 tones of 75 db and a final 120 db startle tone. 25 Ss responded by moving a control stick as rapidly as possible to the onset of each tone. Continuous recordings of heart rate and skin resistance were taken. Autonomic reactivity to the first intense stimulus was found to be positively correlated with response latency, while response time to the final intense stimulus suggests a negative relationship to autonomic levels and reactivity. The primary effect of the second high intensity tone was to significantly exaggerate pre-existing differences between individuals in their reaction time to the preceding moderate intensity stimuli. Possible relationships of this differential stress response to concepts of excitation and inhibition are briefly discussed.

R 11

25,984

Warrick, M.J., Kibler, A.W. & Topmiller, D.A. RESPONSE TIME TO UNEXPECTED STIMULI. Hum. Factors, Feb. 1965, 7(1), 81-86. (USAF Aerospace Medical Research Labs., AFSC, Wright-Patterson AFB, Ohio).

Secretaries, while typing, responded to the sounding of a buzzer by reaching to and pressing a button located to the left of their typewriters. The buzzer was sounded without forewarning at irregular intervals, once or twice a week, over a period of 6 months. The data were analyzed by 4 week periods (5 Ss, 6 responses per S). The response latencies decreased systematically over the 6-month period. During the final 4 weeks 90% of the response latencies were greater than .51 sec., 50% greater than .61 sec., and 10% greater than .82 sec. Under comparative control conditions, when the Ss were alerted to the stimuli, the responses were .1-.14 sec. faster.

25,985

Kibler, A.W. THE RELEVANCE OF VIGILANCE RESEARCH TO AEROSPACE MONITORING TASKS. Hum. Factors, April 1965, 7(2), 93-99. (USAF Behavioral Sciences Lab., AFSC, Wright-Patterson AFB, Ohio).

The basic task dynamics of classical vigilance research are outlined and compared with those of representative contemporary monitoring tasks. It is argued that, while monitoring functions are increasing in modern technology, those particular functions on which the classical vigilance research paradigm is based are declining. The task characteristics which appear to be changing in contemporary monitoring can be summarized as follows: a) the weak, brief duration signals as typically employed in laboratory vigilance studies are rarely encountered in applied monitoring tasks; b) the human monitor typically is required to keep watch over multiple information sources, and frequently more than 1 type of target or information class is the object of his vigil; c) the signals are often complex and multi-dimensional rather than simple and unidimensional events such as those typically employed in laboratory studies; d) in most monitoring tasks, determining the appropriate response to a signal event entails a decision process much more complex than those required in laboratory vigilance studies. Situations which at one time may have required a simple well defined response to an unambiguous signal can be, and often are, accomplished entirely by machines. The difficulty of generalizing from simple laboratory vigilance tasks to the generally more complex applied monitoring functions is discussed. It is suggested that the results of classical vigilance research may not be particularly germane to contemporary monitoring problems. Recommendations for future research are given.

R 12

25,986

Zuercher, J.D. THE EFFECTS OF EXTRANEIOUS STIMULATION ON VIGILANCE. Hum. Factors, April 1965, 7(2), 101-105. (Psychology Dept., Marquette University, Milwaukee, Wisc.).

The influence of extraneous stimulation on vigilance performance was investigated by the method of repeated threshold measurement. During part of a 48-min. vigil Ss were required to stand, stretch, and breathe deeply under 1 condition and to converse with the experimenter during another condition. Performance during the continuing watch improved under both conditions. The results suggest that complex external and internal stimulation can eliminate vigilance decrement in accord with the arousal hypothesis. Since these 2 sources of activity, conversation and exercise, are often readily available to those engaged in monotonous detection tasks, the results also have practical importance. An attempt was made to avoid confounding effects of exercise on conversation with the effects of rest from the vigilance task.

R 20

25,987

Jerison, H.J., Pickett, R.M. & Stenson, H.H. THE ELICITED OBSERVING RATE AND DECISION PROCESSES IN VIGILANCE. Hum. Factors, April 1965, 7(2), 107-128. (Behavior Research Lab., Antioch College, Yellow Springs, Ohio).

Os detected many more of a fixed number of signals when these were among stimuli presented at 5 per min. than when these were among stimuli presented at 30 or 60 per min. The effect, which is associated with either the signal probability or the nonsignal stimulus density, is analyzed with conventional measures and with measures from the theory of signal detectability (TSD). The TSD measures were used to define several possible modes of observing, and the model of vigilance based on decisions about observing could then be related to decision processes in detection performance as considered by TSD. If a single measure of the probability of alert observing is required, the best one is the percentage of detections of the readily detectable signal of the vigilance task. However, the TSD analysis suggested various different "mixes" of modes of observing for the subgroups in this experiment, and these mixes could be specified with the help of heuristic models relating performance measures to the probability of observing.

R 16

25,988

O'Hanlon, J., Jr., Schmidt, A.E. & Baker, C.H. SONAR DOPPLER DISCRIMINATION AND THE EFFECT OF A VISUAL ALERTNESS INDICATOR UPON DETECTION OF AUDITORY SONAR SIGNALS IN A SONAR WATCH. Hum. Factors, April 1965, 7(2), 129-139. (Human Factors Research, Incorporated, Santa Barbara, Calif.).

Research reported nearly 20 yrs. ago concluded that the ability to make auditory pitch discriminations is impaired in some Ss by prolonged listening to sonar returns. As a special type of pitch discrimination, discrimination of doppler, is of importance in classifying sonar signals, an experiment was performed to determine whether or not listening to sonar returns for 90 min. impairs the ability to discriminate doppler. 32 Ss participated in the experiment. 11 doppler signals were employed, ranging in 5-cycle steps from 775 to 825 cps, i.e., the 11 frequencies, 1 per item, were 775, 780, 785, 790, 795 (down doppler), 800 (no doppler), and 805, 810, 815, 820, 825 cps (up-doppler), and each was presented 4 times in a random order. The result was a testing consisting of 44 items. All Ss undertook the doppler test 4 times, before (pre-watch) and after (post-watch) their main watch under 1 experimental condition and before and after their second main watch under the other experimental condition. No impairment was found. A second aim of this experiment was to evaluate the effectiveness of an alertness indicator when listening for sonar signals. With the indicator 16% more signals were detected than without it.

R 11

25,989

McGrath J.J. PERFORMANCE SHARING IN AN AUDIO-VISUAL VIGILANCE TASK. Hum. Factors, April 1965, 7(2), 141-153. (Human Factors Research, Incorporated, Los Angeles, Calif.).

The phenomenon of performance sharing, discovered in an earlier experiment, was verified in the present one, and attributed to differences in signal detectability when 2 vigilance tasks are performed concurrently. Each of 23 Ss stood 6-90 min. watches, 2 on each of the tasks (auditory only, visual only and audio-visual) in counter-balanced order. The Ss in Group I (11) were given easy auditory signals and difficult visual signals; the Ss in Group II (12) were given easy visual signals and difficult auditory signals. Each S received a different signal schedule on each of his 6 watches. Within each schedule the intersignal intervals ranged from 9 to 300 sec.; and the distribution of intersignal intervals was rectangular. Performance on a vigilance display presenting easily detectable signals was shown to be enhanced by requiring the O to monitor simultaneously another display, presenting difficult signals via a different sensory modality. Several theoretical approaches to the explanation of the phenomenon are discussed, and implications for display design and research are suggested.

R 16

25,990

Broadbent, D.E. & Gregory, Margaret. EFFECTS OF NOISE AND OF SIGNAL RATE UPON VIGILANCE ANALYSED BY MEANS OF DECISION THEORY. Hum. Factors, April 1965, 7(2), 155-162. (Applied Psychology Research Unit, MRC, Cambridge, England).

A vigilance task was performed in which regular flashes of light were monitored for an occasional flash of greater brightness. Following every flash a decision of signal present, signal absent, or doubtful had to be recorded. 2 separate groups received high and low signal rates with a variety of the task in which the flashes occurred only on 1 lamp; another group received a high signal rate divided between 3 simultaneously flashing lights. An analysis in terms of decision theory showed that detrimental changes during the watch period were entirely attributable to movement of the S's criterion for reporting a signal: his sensitivity to the signals if anything improved during the work period. In addition, criterion changes in the presence of intense noise occurred at high signal frequencies, even when only 1 source of information was involved: thus showing that division of attention between different sources is not essential for harmful effects of noise. In addition, criteria under quiet conditions were different at different signal rates.

R 14

25,991

Montague, W.E., Webber, C.E. & Adams, J.A. THE EFFECTS OF SIGNAL RATE AND RESPONSE COMPLEXITY ON EIGHTEEN HOURS OF VISUAL MONITORING. Hum. Factors, April 1965, 7(2), 163-172. (University of Illinois, Urbana, Ill.).

Ss monitored a complex display composed of 3 rows of 4 digital display boxes each containing a constant reference number. A change in the number lasting 6 sec. was the signal to be detected. Signals occurred for different groups of Ss at rates of either 16 or 64 per hr. Response complexity was varied by having some Ss merely report the change while others evaluated the size of the change. 4 groups of 15 Ss received a different combination of rate and complexity. Neither rate nor complexity influenced performance. All groups showed significant vigilance decrement during the session. The magnitude of the decrement was relatively trivial, however, and in substantial agreement with other studies. In complex tasks man seems to be an adequate monitor over rather extended time periods.

R 24



25,992

Sergeant, R.L. EXAMINATION OF NOISE LEVELS FROM SUBMARINE PRAIRIE/MASKER INSTALLATIONS. BuMed Proj. MR005.14 1200 2.06, Memo. Rep. 65 10, July 1965, 4pp. USN Medical Research Lab., New London Submarine Base, Groton, Conn. (AD 470649)

The problem here was to determine the effects on human listeners of the Submarine PRAIRIE/MASKER system noise. On USS BANG (SS385) the airborne noise of the PRAIRIE/MASKER system was measured with an octave-band sound level meter, and found to exceed the Damage Risk Criterion of the Bureau of Medicine and Surgery's Hearing Conservation Program. The noise will also seriously interfere with speech reception, and will cause a slight transient decrease in hearing acuity if listened to for more than a few min. In submarine compartments where this system is installed the personnel exposed should have the benefit of the Navy's Hearing Conservation Program. A similar sound survey should be performed on USS SALMON or USS COBLER, where the mounting is in a different compartment than on USS BANG.

25,993

Simon, C.W. RAPID ACQUISITION OF RADAR TARGETS FROM MOVING AND STATIC DISPLAYS. Hum. Factors, June 1965, 7(3), 185-205. (Systems Development Corporation, Santa Monica, Calif.).

Aerial-reconnaissance radar imagery can be presented to an O for near-real time interpretation in 2 ways: as a continuously moving display or in discrete, static steps. Both were studied in a laboratory experiment designed to determine their effect on the probability and speed of target acquisition. The results indicated: a) no significant differences in the number of real or false targets acquired; b) significantly less time required to find a target on the moving display; and c) the time difference increased as targets became more difficult to recognize and as the available observation time increased. The relevance of this study for equipment design considerations and the generality of the results to other near-real-time reconnaissance missions are discussed. It is concluded that even among a wide variety of conditions not included in this study, where targets are of simple, well-defined patterns capable of recognition with little study, the moving presentation mode--in balance--will result in better target acquisition performance.

R 7

25,994

Monty, R.A. & Ruby, W.J. EFFECTS OF ADDED WORK LOAD ON COMPENSATORY TRACKING FOR MAXIMUM TERRAIN FOLLOWING. Hum. Factors, June 1965, 7(3), 207-214. (USA Human Engineering Labs., Aberdeen Proving Ground Md. & Engineering & Research Staff, Ford Motor Company, Dearborn, Mich.).

The relative merits of presenting each of 2 command signals ( $\sigma_e$ , the elevator deflection angle, and  $\psi$ , the aircraft flight-vector angle) on a compensatory display for manual control of a simulated aircraft on a terrain-following mission were examined. 24 Ss, each with previous piloting experience, were used in the experiment. The Ss were randomly assigned to 2 groups of 12 each, 1 group corresponding to each of the 2 command signals. Within these 2 groups, the performance of all Ss was examined with both one-axis (longitudinal control) and two-axis (longitudinal plus azimuth control with bank angle) tracking in combination with the level of additional work load (no work load, or no needle deflection, light work load represented by an average of 6 meter deflections per min., and heavy work load represented by an average of 15 needle deflections per min.). In all cases, the ideal trajectory was over moderately rough terrain and the aircraft velocity was 0.75 mach. It was found that imposing additional work loads on the pilot led to a greater decrement in tracking performance with the  $\psi$  command than with the  $\sigma_e$  command. Further, the work load task itself was performed with greater proficiency while tracking with the  $\sigma_e$  command. The apparent merits of the  $\sigma_e$  command warrant further investigation.

R 7

25,995

Wienke, R.E. & Steedman, W.C. APPARENT MOTION IN GEOMETRIC DEPTH. Hum. Factors, June 1965, 7(3), 215-218. (USAF Aerospace Medical Research Labs., AFSC, Wright-Patterson AFB, Ohio).

The ability to detect small excursions of apparent movement of a point light source was investigated. Preliminary work indicated that apparent motion in the frontal parallel plane will be observed, under conditions in which the 2 stimuli are separated from each other in depth, if the distance from the O to the stimuli is large with respect to the distance between the stimuli. If the O is off the optical axis, apparent motion will be induced; if the O is lateral to the optical axis, the apparent motion will be horizontal. If the O is above or below the optical axis, the apparent motion will be vertical. If the O is both lateral to and above or below the optical axis, diagonal movement will be seen. Essentially the movement will be seen on a 4 quadrant Cartesian coordinate system wherein the optical axis serves as the origin. It was hypothesized that a visual display which graphically presents directional information might serve as a precision guidance device providing there is sufficient sensitivity to apparent motion. Apparent movement was achieved by alternately presenting a point source in 2 different planes. The presentations, each lasting about 500 msec, had an overlap of approximately 8 msec. Using 7 Ss, the limen for apparent motion was a stimulus separation of 43.9 mm, which is a visual angle of 1' 21". Possible application of the effect in a highly precise visual guidance system is discussed in light of the results.

R 6

25,996

Chapanis, A. & Lockhead, G.R. A TEST OF THE EFFECTIVENESS OF SENSOR LINES SHOWING LINKAGES BETWEEN DISPLAYS AND CONTROLS. Hum. Factors, June 1965, 7(3), 219-229. (Psychology Dept., Johns Hopkins University, Baltimore, Md.).

This experiment tested the effectiveness of sensor lines (heavy lines drawn on a control panel to show the linkages between displays and controls) on simple panels made up of lights (the displays) and keys (the controls). The 3 independent variables were: a) size of panel (2 sizes were tested); b) compatibility of the display-control linkages (a maximally compatible and a highly incompatible arrangement were used); and c) the presence or absence of sensor lines. 8 panels were constructed to test all possible combinations of these 3 independent variables. 80 male Ss in all (10 for each panel) were used. The S's task was to push the appropriate key as soon as a light had been turned on. Each S was given 240 consecutive trials on the panel to which he was assigned. Dependent measures were: time to first response, time to correct response, and errors. The results show that it is more important to make the linkages between displays and controls compatible than it is to use sensor lines which show schematically the linkages between displays and controls. Sensor lines appear to have a limited kind of usefulness for panels of the type tested here: the lines improved performance only when the linkages between displays and controls were not compatible.

R 6

25,997

Peterson, J.R. RESPONSE-RESPONSE COMPATABILITY EFFECTS IN A TWO-HAND POINTING TASK. Hum. Factors, June 1965, 7(3), 231-236. (Honeywell, Inc., Waltham, Mass.).

An experiment was conducted to determine whether or not response-response compatibility effects were present in a simple perceptual-motor task where simultaneous 2-hand pointing responses were required. 3 Ss were used. The experimental apparatus for this study consisted of 2 sq. (20x20-in.) response panels, a stimulus panel and 2 response feedback panels. Each response panel contained 4 response targets and a "home" button, located on a cross-shaped error surface. The response targets were 1/2-in. diameter metal discs in a diamond pattern around the "home" button. The error surface consisted of 2 crossing bands of silver conductive paint, 3 in. wide and centered on the response targets and "home" button. 4 electric timers measured the reaction times and movement times for the 2 hands. 25 different 2-hand response combinations were possible. These response combinations were designated by a 2-letter code, the 1st letter indicating the direction of movement of the left hand and the 2nd letter the direction of movement of the right hand. The sequence of events in each trial was as follows: A warning signal (a "break" in the white noise heard by the S) was presented. After a constant 2-sec. fore-period, the stimulus light (on the stimulus panel) was lighted. The S then moved his hand(s) from the "home" button(s) to the pre-designated target(s) as quickly and accurately as possible. If the S touched the correct target(s), a green light appeared on the response feedback panel(s). If he touched the error surface first or missed the target, a red response feedback light was activated. The results indicate that both response precision and movement time are affected by the particular combinations of responses used. The results are interpreted as supporting the contention that R-R compatibility effects do exist--even in quite simple perceptual-motor tasks. A distinction is made between Stimulus-Response (S-R) compatibility effects and Response-Response (R-R) compatibility effects.

R 3

25,998

Smith, S.L. & Duggar, B.C. DO LARGE SHARED DISPLAYS FACILITATE GROUP EFFORT? Hum. Factors, June, 1965, 7(3), 237-244. (Mitre Corporation, Bedford, Mass. & Bio-Dynamics Inc., Inc., Cambridge, Mass.).

12 4-man groups searched and counted visually displayed items. In 1 session, they used a large display shared in common by the group members; in another session, separate smaller displays were viewed individually. Information was presented under conditions of equal visual angle, so that these 2 display modes were logically equivalent. Performance was 15% faster with the large group display than with the small individual displays. There was no significant difference in error frequency. Some Ss preferred the large display, some the small. In a supplementary study, running individual Ss rather than groups, there were no differences in speed or accuracy between the display modes. This suggests that the difference in group performance time resulted from some facilitating effect of the shared display on the process of group interaction.

R 5

25,999

Hammer, C.H. & Ringel, S. INFORMATION ASSIMILATION FROM CODED AND UNCODED INDIVIDUAL AND GROUP DISPLAYS. Hum. Factors, June 1965, 7(3), 245-255. (USA Personnel Research Office, OORD, Washington, D.C.).

This report describes 2 related studies designed to evaluate the effects of conspicuity coding of updated alpha-numeric information and to compare the relative effects of individual and group displays. Amount of information presented and amount of information updated were varied. Principal findings lend support to the incorporation and use of coding capabilities in current and proposed command systems: a) mean time required to locate coded updates was approximately 65% less than for uncoded updates; b) as the number of Elements Presented increased from 36 to 90, mean time taken to locate coded updates increased 100%, whereas time taken to locate uncoded updates increased 150%; c) use of coded updates resulted in a reduction in errors of omission by approximately 50%. While findings regarding individual vs Group displays are not conclusive, they do suggest that if uncoded updated information is presented, there may be a whole series of information assimilation tasks which can be more efficiently accomplished with Individual than with Group displays.

R 5

26,000

Schohan, B., Rawson, H.E. & Soliday, S.M. PILOT AND OBSERVER PERFORMANCE IN SIMULATED LOW ALTITUDE HIGH SPEED FLIGHT. Hum. Factors, June 1965, 7(3), 257-265. (North American Aviation, Inc., Columbus, Ohio).

Responses of experienced pilots and aerial Os were studied in simulated low-altitude, high speed (LAHS) flight. The pilots "flew" 3-hr. surveillance missions at airspeeds of .4M and .9M in different degrees of simulated atmospheric turbulence. Flying ability decreased from .4 to .9M; however, intensity of vertical accelerations did not seem to affect flying ability except at the most severe levels. Target identification was unimpaired by either turbulence or airspeed. The Os also flew 3-hr. missions while experiencing acceleration time histories recorded from the pilot's flights. Target identification deteriorated as airspeed increased from 0.4 to 0.9 Mach. Gust intensity did not affect performance of any of their tasks. Performance efficiency on all tasks did not deteriorate from beginning to end of the missions of both pilots and Os.

R 3

26,001

Zavala, A., Locke, E.A., Van Cott, H.P. & Fleishman, E.A. STUDIES OF HELICOPTER PILOT PERFORMANCE: I. THE ANALYSIS OF MANEUVER DIMENSIONS. Hum. Factors, June 1965, 7(3), 273-283. (American Institutes for Research, Washington, D.C.).

Measures of helicopter pilot proficiency were obtained on several hundred student pilots at 2 phases of their training. The intercorrelations among 2 separate sets of maneuver proficiency measures for each phase, obtained near the end of the Primary and Basic training phases, were subjected to factor analysis. The major results were: a) the 16 & 12 maneuvers in the Primary and Basic phases, respectively, could be described in terms of 6 or 7 independent factors; b) the major factors in the Primary phase analysis were named: Take Off; Autorotation and Forced Landing; Hovering Turn; Traffic Pattern; Forced Landing from Hover; and Land; c) the major factors to emerge in the Basic phase analysis were named: High Reconnaissance; Forced Landing from Hover; Slope Operation; Take Off; Take Off Preparation; and Low Reconnaissance to Landing; d) there was considerable similarity in the factors obtained from the analyses in the 2 phases even though there were differences in the maneuvers performed in the 2 phases; e) the common factors were interpreted in terms of the sequences of operations required to perform them; f) the findings were discussed in terms of the implications for understanding the structure of complex skills and for the measurement of pilot proficiency.

R 19

26,002

Locke, E.A., Zavala, A. & Fleishman, E.A. STUDIES OF HELICOPTER PILOT PERFORMANCE: II. THE ANALYSIS OF TASK DIMENSIONS. Hum. Factors, June 1965, 7(3), 285-302. (American Institutes for Research, Washington, D.C.).

Measures of helicopter pilot proficiency were obtained on several hundred student pilots at 2 stages of their training. The intercorrelations among individual task scores obtained from evaluations made during certain standard flying maneuvers near the end of the Primary and Basic training phases, were subjected to factor analysis. The major results were: a) the scores tended to form task factors; b) the interpretable task factors in the Primary phase were named: Air Speed, Pitch Application in Forced Landing from Hover, Line and End of Descent, RPM, Amount of Pitch, Air Speed Reduction and Rate of Descent, Rate of Closure, Power Off Pitch Application, and Down Wind Air Speed; c) the interpretable task factors in the Basic phase were named: Drifts, Low Altitude RPM, Rate of Closure, Confined Area Spatial and Angular Judgments, Amount and Timing of aft Cyclic w/o Power, Power Off Pitch Application, Air Speed and Air Speed Reduction, High Altitude RPM, Observation Angle of Sight, Air Speed and Air Speed Increase, and Low Reconnaissance Descent Angle; d) at least 6 factors were common to the 2 analyses, even though there were marked differences in the item composition of the forms used in the Primary and Basic training phases; e) the common factors were interpreted in terms of the operations required to perform them.

R 18

26,003

Fiore, M.V. THE REVOLUTION OF LOGISTICS. Hum. Factors, Aug. 1965, 7(4), 311-314. (General Precision, Inc., Little Falls, N.J.).

A review of developments in logistics support over the past decade is presented. The concepts of systems engineering, the "system approach," and the need for system effectiveness in military weapons has created a revolution in the traditional concepts of engineering and logistics. 1 major problem has been the introduction into the traditional aerospace organizational division of engineering and logistics of several new disciplines (e.g., reliability, maintainability, personnel subsystem, value engineering, and so forth). Owing in large part to recent Department of Defense specifications, the traditional definitions and concepts of logistics must be changed.

26,004

Moore, C.B. IMPROVED LOGISTICS PLANNING THROUGH MATHEMATICAL MODELS. Hum. Factors, Aug. 1965, 7(4), 315-328. (Operations Research Section, General Dynamics, Fort Worth, Tex.).

An integrated set of mathematical models has been developed for use in the identification and quantitative measurement of logistics problems, and the prediction of probable results of proposed changes or corrective actions. The models can be used individually or in various combinations. Used together, they provide the logistics planner with a means for making a complete analysis of requirements for logistics and operations during any phase of a weapon system program. The models are dynamic, continuing to improve with time and application to many key logistics problems. A significant recent improvement was the addition of the Incremental Cost-Effectiveness Model (ICEM) to the model family. The availability of data sources and the provision of data for use as inputs is a lesser problem today because of the multiple model philosophy, the improved state-of-the-art in model building, the advanced computer techniques, and, in particular, the fact that contractors are now required to produce large quantities of logistics data in all phases of a weapon system program. Under most conditions, available logistics data are sufficient to meet model input requirements. Model users at all levels of management and project engineering have found the models described herein to be usable and to fulfill their needs for rapid and accurate logistics planning. The models are versatile and flexible so that improvements can be incorporated as feasible. Although the models discussed are specifically oriented to aircraft, similar models have been developed for other types of systems.

R 11

26,005

Sinchak, J. DATA PROCESSING--A MEANS TOWARD IMPROVED PRODUCT SUPPORT. Hum. Factors, Aug. 1965, 7(4), 329-334. (IBM Federal Systems Div., Washington Systems Center, Bethesda, Md.).

Increasing stature and recognition are being provided to logistic support activities by both government and industry. Within industry, the responsibility for support functions rests with the product support organization. This article discusses the growing role of data processing in contractor product support operations. It covers the responsibilities of various functional areas comprising the product support organization and briefly mentions examples of how data processing is being applied in several of these activities. The factors influencing the introduction of data processing into the product support field are also covered. Finally, the benefits achieved by the installation of machine-aided systems and the related impact on support performance are also emphasized.

26,006

Pridgen, W.L. & Demougeot, G.M. NEEDED: NEW METHODS FOR WEAPON SYSTEM TRAINING. Hum. Factors, Aug. 1965, 7(4), 335-345. (Westinghouse Electric Corporation, Baltimore, Md.).

The effectiveness of every weapon system is directly proportional to the capability of the military personnel responsible for its use and maintenance. A key factor in determining the capabilities of these personnel is the training which they receive. This article explains how this training is presently accomplished and new training techniques are discussed. 4 methods for improving maintenance training are described: a) team training; b) follow-on training at operational sites; c) programmed instruction; and d) a specific example of a "directed troubleshooting" technique. Maintenance training can be improved by new techniques of organization, new methods of teaching, and by developing new working skills.

26,007

Walker, R.W. AN EVALUATION OF TRAINING METHODS AND THEIR CHARACTERISTICS. Hum. Factors, Aug. 1965, 7(4), 347-354. (Martin Company, Denver, Colo.).

The primary purpose of this report is to present guidelines which a training man might use in selecting training media. It is felt that such a set of guidelines could go far in acquainting training personnel with various instructional techniques and enumerating the advantages and disadvantages of each medium. 16 training techniques were rated by experienced training personnel each with respect to 34 training selection criteria. The following techniques were considered: a) On-The-Job-Training; b) Job Experience Training; c) Discussion; d) Lecture; e) Laboratory; f) Tests; g) Slides and Audio; h) Filmstrip and Audio; i) Sound Films; j) Programmed Instruction; k) Radio, Tape or Record; l) Texts; m) Simulators; n) Sleep Teaching; o) Closed circuit TV. Training personnel tend to narrow their selection criteria to those elements which are administratively and contractually imposed. Educational/psychological principles tend to be overlooked. Selection on training techniques in practice should be on a broader and more systematic basis if the selection is to be properly justified.

26,008

McGinty, F.C. NUCLEAR POWER PLANTS AND MAINTAINABILITY. Hum. Factors, Aug. 1965, 7(4), 355-361. (Nuclear Div., Martin Company, Baltimore, Md.).

The expanding use of nuclear energy in the power generation field is such that the maintainability aspects of design and maintenance concepts will soon be of interest to an increasingly larger number of designers, logisticians and human factors engineers. This article presents a broad-brush treatment of the effect that radiations have on maintenance of nuclear power plants. It provides examples of how an acceptable degree of maintainability is achieved on a specific military nuclear power plant despite these deadly radiations. The article concludes with a brief presentation of present developmental programs that will significantly improve the maintainability of nuclear power plants: a) reactors having 5- to 10-yr. lives are nearing reality--thus eliminating refueling during the useful life of military equipment; b) automatic reactor control techniques are being developed that will eliminate the need for an operator except for startup and shut-down operations; c) thermoelectric and thermionic converters are being developed for converting reactor thermal energy directly to electrical energy without moving parts. (The application of these 3 advancements will result in the development of a simple, trouble-free nuclear power plant.); d) space exploration power requirements can and must be met by nuclear energy.

26,009

Eames, R.D. & Starr, J. TECHNICAL PUBLICATIONS AND THE USER. Hum. Factors, Aug. 1965, 7(4), 363-369. (Raytheon Company, Waltham, Mass.).

The low cost of technical publications relative to hardware costs is asserted to be no reason for minimizing the important role of publications in equipment functioning and system performance. The mechanistic orientation in psychology and elsewhere is challenged and reasons are given for added human factors contributions to make technical information more usable. Studies are cited which reveal numerous inadequacies in technical handbooks at the point of use. Conventional studies of technical message variables are suggested to be of only slight relevance to military publications design due to different populations, environments, and conditions of stress. A concept of technical handbooks as devices to control behavior is explained. The need is put forth for a more empirical rather than subjective orientation to technical writing. Recommendations include a proposal for investigation of "user-designed" handbooks, integration of publications development within system development, and study to determine new criteria for effective writing and for the selection and training of writers.

R 31

26,010

Wiedman, T.G. & Ireland, F.H. A NEW LOOK AT PROCEDURES MANUALS. Hum. Factors, Aug. 1965, 7(4), 371-377. (Systems Development Corporation, Santa Monica, Calif. & Radio Corporation of America, Moorestown, N.J.).

Most current operator procedure documents are excessively wordy and not sufficiently keyed to the stimuli that should trigger operator actions. With the new approach discussed in this article, required operator actions are directly related to the specific visual or auditory stimuli received either from the equipment or from other individuals. Thus, given an indication, such as a console alarm or a voice request, the operator can immediately determine, from the manual, what actions to take. The meaning of each stimulus as well as the system implications of the operator's reactions are presented side-by-side with every stimulus-action step. Longer, more involved, decision and action sequences are presented in easily interpretable diagrammatic form.

26,011

Graffis, L.F. THE FIELD ENGINEER--AMBASSADOR WITHOUT PORTFOLIO. Hum. Factors, Aug. 1965, 7(4), 379-386. (Bendix Field Engineering Corporation, Ann Arbor, Mich.).

Field engineering considerations for long-duration service and support involve not only the operation and maintenance of a system, but the abilities, import, and impact of the men who will conduct the operation and maintenance in the field. In the case of foreign assignment, habitability or diplomacy may be as much a problem as engineering. The role of the field engineer as a professional field support individual is discussed. The standards and requirements of field engineering are differentiated and discussed. Although ideally the field engineer is a graduate of an accredited college of engineering, many trade and technical schools provide the practical technical training for field engineering problems. The requirements are imposed upon the field engineer by the very nature of the business. The Bendix Training Program emphasizes the following areas: Professional attitudes and motivations; Thorough knowledge of the equipment; Familiarization with the environment; Dedication to getting the job done right. Human factors is introduced in terms of practical examples experienced by Bendix Field Engineering during its 15 yrs. of world-wide field support.

26,012

Lippy, L.J. INTEGRATED MANAGEMENT IN ICBM BASE ACTIVATION. Hum. Factors, Aug. 1965, 2(4), 387-400. (Martin Company, Denver, Colo.).

The period from 1954 to 1964 is often referred to as the Intercontinental Ballistic Missile (ICBM) era by the Air Force and Aerospace Industry. This decade covered the period of research, development, design, and test of ICBM's, their ground support equipment and the activation of strategically located bases with facilities, equipment and support services. During this period, the Atlas, Titan and Minuteman became operational. The management, organization, and responsibilities for the activation of a Titan II Operational Base (Davis-Monthan, Arizona) are herein described. Concurrence and specific examples of management actions in solving problems under field conditions to assure delivery of a complete Weapon System are explained. Management committees were formed to establish the policies and concepts required to solve problems and expedite master schedule functions. The following committees and programs are described: a) Data Exchange Program; b) Control Room; c) Work Standard Control; d) Review and Inspection Teams; e) SATAF/Martin Review Team; f) Dynamo Alert System; g) Field Changes; h) Configuration Control and Block Plan; i) Propellant Transfer System (PTS); j) Walk-Through; k) Acceptance and Turnover Team; l) Technical Approval Team.

26,013

Haglund, R.F. ORIENTATION AND EDUCATION TOWARD THE CONCEPT OF INTEGRATED MAINTENANCE MANAGEMENT. Hum. Factors, Aug. 1965, 2(4), 401-407. (Collins Radio Company, Cedar Rapids, Iowa).

The scope and complexity of functions required to maintain equipments or systems in operational readiness has multiplied with the increased sophistication of product technology. Support costs often exceed original investment and demand a high order of managerial skill and coordination for their control. Development of improved maintenance/support techniques and an Integrated Maintenance Management concept have been fostered especially in the military services and the defense industry. Wider diffusion of knowledge in this field is needed and will be available through educational programs now being planned in the Department of Defense and the National Security Industrial Association. Training for maintenance managers will encourage continuing improvements in technical support functions. Orientation of other management people should yield better coordination and help ensure operational success.

26,014

Burrows, A.A. CONTROL FEEL AND THE DEPENDENT VARIABLE. Hum. Factors, Oct. 1965, 2(5), 413-421. (Douglas Aircraft Company, Inc., Long Beach, Calif.).

The definition and effects of "feel" at the control-limb interface are discussed together with some current problems and experiments. The relationship which "feel" bears to the error term used in describing complex tracking behavior, is described and recommendations made for further research.

R 20

26,015

Weltman, G., Christianson, R.A. & Egstrom, G.H. VISUAL FIELDS OF THE SCUBA DIVER. Hum. Factors, Oct. 1965, 2(5), 423-430. (University of California, Los Angeles, Calif.).

The restricted visual fields available to SCUBA divers were examined by means of an underwater perimetry apparatus. Measurements were obtained for 3 standard partial masks (covering only the eyes and nose), 1 atypical "wrap-around" partial mask, and 1 full-face mask. A group of 6 experienced divers was selected. Only monocular fields were measured for the standard masks. In an experimental session, a S tested all 3 standardized masks while in a horizontal position, and 1 of the 3 while positioned vertically. The vertical run was conducted either head up or head down. The S made 2 runs with his left eye and 2 with his right. All of the test runs were made at night, in a dimly illuminated swimming pool, with the S at a depth of approximately 8 ft. Visual field limits were recorded at 30° increments of the arc. At each position, the E started with the target light well within view; he then moved it slowly outward, recording only the point at which the S indicated that it had disappeared. Data are presented along with some consideration of the interactions between mask design and visual field, and a brief resume of procedural variables affecting human factors experimentation underwater.

R 4

26,016

Shackel, B. QUIS? A RETRIEVAL SYSTEM FOR LIBRARY DOCUMENTS AND THE TUFTS AND DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH (D.S.I.R.) HUMAN SCIENCES BIBLIOGRAPHIES. Hum. Factors, Oct. 1965, 2(5), 431-449. (Psychological Research Lab., EMI Electronics Ltd., Hayes, Middlesex, England).

A comprehensive description is given of a retrieval system which can be applied to the personal library of an individual scientist, to the general library of a laboratory or research unit, and to bibliographies of abstracts. The methods used are described in terms of their application to the field of Human Factors, but they are relevant to similar information storage and retrieval problems in any field. Primary features of the system are the serial assignment of accession numbers, an author card file, an accession card file, search using 'feature' cards ('peek-a-boo'), a specially designed desk for storing, punching, and searching the feature cards, and the adoption of the Tufts Topical Outline as the index language. Full operating instructions are given in an appendix.

R 18

26,017

Kolesnik, P.E. & Teel, K.S. A COMPARISON OF THREE MANUAL METHODS OF INPUTTING NAVIGATIONAL DATA. Hum. Factors, Oct. 1965, 2(5), 451-456. (TRW Systems, Thompson Ramo Wooldridge, Redondo Beach, Calif. & Human Factors Dept., Autonetics, Anaheim, Calif.).

This study evaluated the effectiveness of 3 simple manual methods of entering navigational data on cards which might subsequently be used to enter the same data into a computer. Results indicated that use of either a stylus punch or mark sense method required less time and resulted in fewer errors than did use of a hand punch method. No significant differences were found between the stylus punch and mark sense methods in either speed or accuracy of performance. The stylus punch method is recommended over the mark sense, particularly for airborne use, because it requires less elaborate data processing equipment. Furthermore, data from this and previous studies suggest that use of the stylus punch is preferable to use of thumbwheels or pushbuttons.

R 3

26, 018

Benson, A.J., Huddleston, Jo H.F. & Rolfe, J.M. A PSYCHOPHYSIOLOGICAL STUDY OF COMPENSATORY TRACKING ON A DIGITAL DISPLAY. Hum. Factors, Oct. 1965, 7(5), 457-472. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

Comparable performance on a compensatory tracking task was achieved with a purely digital altimeter display and with a combined digital and scale-and-pointer display. 16 male Ss participated. After electrodes were applied the Ss were allowed 2 minutes practice on each of the 2 displays. This was followed by a 4 minute period in which only the secondary task was performed. In the experiment Ss undertook 2 periods of tracking on each of the 2 displays. In one of the periods the tracking was performed without the secondary task and in the other with the secondary task. The length of the tracking periods was 4 minutes. There was a 2 minute rest period between each 4 minute task period, which allowed resting values of the physiological variables to be obtained. Performance of a subsidiary, light responding task was degraded significantly when the digital task was employed. In the presence of the subsidiary task a larger change was recorded in a number of physiological variables (heart rate, muscle activity, skin resistance and respiration) with the digital than with the counter-point display. Thus, both performance and physiological measures indicated that parity of performance on the primary task was achieved by increased 'effort' when using the digital display.

R 26

26,019

Spesock, G.J. & Lincoln, R.S. HUMAN FACTORS ASPECTS OF DIGITAL COMPUTER PROGRAMMING FOR SIMULATOR CONTROL. Hum. Factors, Oct. 1965, 7(5), 473-482. (Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif.).

Because of the enormous present day effort devoted to the preparation of digital computer programs, special attention should be given to the human factors aspects of program development. Currently available program compilers represent a significant application of certain human factors principles, but are not generally applicable to problems of "real time" programming. Since the creation of appropriate compilers is important to simulation methodology this report includes a detailed description of a "real time" compiler developed for display/control simulation on a small computer in a human factors laboratory. The compiler described was written for a system called PEPSS (Programmable Equipment for Personnel Subsystem Simulation). The fundamental approach was to develop a general purpose program which performs all of the types of panel operations required, and then to add to this program the data tables that describe the display/control relations peculiar to the system to be simulated.

26,020

Hershman, R.L. & Hillix, W.A. DATA PROCESSING IN TYPING: TYPING RATE AS A FUNCTION OF KIND OF MATERIAL AND AMOUNT EXPOSED. Hum. Factors, Oct. 1965, 7(5), 483-492, (USN Electronics Lab., Bureau of Ships, San Diego, Calif.).

The effects on performance of kind of material (text, random words, or random characters) and amount of material exposed (1,2,3,6, or an "unlimited" number of characters) were jointly studied in a typewriting task. Five Ss participated in the experiment. Before the experimental session began, each S was given approximately 1 hour of conventional typing practice. This was thought to be sufficient to avoid any transient effects that might be associated with changing to the experimental typewriter. For the random characters, only a small increase in typing rate was observed beyond 3 characters exposed. For the words and text, rates were generally higher and continued to increase substantially up to the unlimited exposure condition. The results are discussed in terms of a parallel processor which employs unitary "higher-order responses".

R 17

26,021

Rusis, G. & Snyder, H.L. THE EFFECTS OF TV CAMERA FIELD OF VIEW AND SIZE OF TARGETS UPON AIR-TO-GROUND TARGET RECOGNITION. Hum. Factors, Oct. 1965, 7(5), 493-501. (Autonetics, Div., North American Aviation, Inc., Downey, Calif.).

A simulation experiment was performed to determine the effects of TV camera lens field of view and target size upon air-to-ground target recognition via closed-circuit television. Measures of performance were probability of correct target recognition, range of correct recognition, and proportion of errors committed. As the field of view decreased, (1) probability of correct recognition decreased ( $P < .01$ ), (2) mean range of correct recognition increased ( $P < .01$ ), (3) errors of commission did not vary ( $P > .05$ ), and (4) errors of omission increased ( $P < .01$ ). As target size decreased, (1) probability of correct recognition decreased ( $P < .01$ ), (2) mean range of correct recognition decreased ( $P < .01$ ), (3) errors of commission increased ( $P < .01$ ), and (4) errors of omission increased ( $P < .01$ ). The increase in mean recognition range with decreases in field of view was greater for large targets than for small targets ( $P < .05$ ). The field of view had little or no effect upon errors of commission for large targets; however, for small targets, the smaller the field the greater the proportion of errors of commission ( $P < .01$ ).

R 7

26,022

Gustav, Alice. NEGATIVE TRANSFER IN COMPLEX MATERIAL. J. Psychol., Jan. 1965, 59(First Half), 61-65. (Psychology Dept., New York University, New York, N.Y.).

It has been customary to designate special concepts by ordinary English words in the behavioral sciences rather than to coin new words as is done in the physical sciences. This study was concerned with the possibility of negative transfer in learning particular psychological concepts. At the beginning of an introductory course in psychology, 227 students were asked to define ordinary everyday English words and to guess the technical psychological concepts represented. The words selected were: adaptation, affect, conditioning, experience, extinction, imprinting, perception, plateau, reliability, reminiscence, threshold, and validity. In the final examination for the course, questions were inserted that required the students to understand the concepts and the know the terminology. From a comparison of responses at the beginning and end of the term it seems that negative transfer was not involved or, if present, was well overcome.

R 2

26,023

Zegers, R.T. & Cahill, Mary C. THE LATENCY OF PRICKING-PAIN SENSATION: I. THE EFFECT OF ACETOPHENETIDIN AND ANACIN. II. THE EFFECT OF REPEATED STIMULATION. *J. Psychol.*, Jan. 1965, 59 (First Half), 101-108. (Psychology Dept., Fordham University, New York, N.Y.).

To investigate the effect of two analgesic dosages of acetophenetidin and of Anacin upon the latency of the pricking-pain sensation under conditions of single and repetitive stimulation of the skin, each of six trained male subjects participated in 12 120-minute sessions (each subject had two sessions with 1.0 gm and with 0.5 gm dosages of each drug, placebos, and no capsule). Threshold (latency) determinations were made every five minutes, each time on a different one of 24 numbered spots on the volar surfaces of the forearms. Concomitantly Spot A on the left forearm was stimulated repeatedly every five minutes, and Spot B, on the right forearm, every 10 minutes. No analgesic effects were observed on pricking-pain latency. Analyses of variance showed no significant interaction, no consistent time effect, and no significant conditions effect that could be interpreted as resulting from drug action. Repetitive stimulation at five- and 10-minute intervals was thus alone responsible for the latency elevations observed on Spots A and B respectively. It was suggested that such repetitive stimulation may have contributed to an indeterminate extent to the positive results with analgesics reported by Hardy, Wolff, and Goodell.

R 16

26,024

Mayzner, M.S. & Adler, S. A FURTHER STUDY OF INFORMATION "CHUNKING" AND SHORT-TERM RETENTION. *J. Psychol.*, Jan. 1965, 59 (First Half), 125-130. (Engineering & Science School, New York University, University Heights, Bronx, N.Y.).

The present study was designed to examine the effects of letter frequency and organizational pattern on the short-term retention of letter stimuli. A total of 60 Ss were tested individually in a two-by-four mixed analysis-of-variance design with two levels of digram-letter frequency (high and low) and four levels of organizational pattern (12 lines with one letter per line, six lines with two letters per line, four lines with three letters per line, and one line with 12 letters per line). The results showed that both main effects and the interaction term are significant and can be interpreted in terms of Miller's "chunking" model of information storage and retrieval.

R 6

26,025

King, D.J. & Wolf, S. THE INFLUENCE OF DELAYED AUDITORY FEEDBACK ON IMMEDIATE AND DELAYED MEMORY. *J. Psychol.*, Jan. 1965, 59 (First Half), 131-139. (Psychology Dept., Albion College, Albion, Mich.).

Forty-two Ss were run in one experimental and in 2 control conditions. The Ss recalled a short story immediately after reading it and again 24 hours later. All Ss were monitored on 2 physiological variables during reading. The experimental group was subjected to a 0.2-sec. delayed auditory feedback in the middle section of the story. One control group received no special treatment; the other received shock at the point in the story at which the experimental group received delayed auditory feedback. Both the experimental group and the control group that received shock showed marked changes in GSR measurements during the reading of the middle section of the story. The immediate memory of the story was significantly poorer for the experimental group as contrasted with that for each of the control groups. For accuracy of delayed memory, there were no significant differences among the 3 groups.

R 9

26,026

King, D.J. & Dodge, Ann-Michelle. THE INFLUENCE OF ORAL RECALL ON IMMEDIATE AND DELAYED MEMORY FOR MEANINGFUL MATERIAL PRACTICED UNDER DELAYED AUDITORY FEEDBACK. *J. Psychol.*, Jan. 1965, 59 (First Half), 141-147. (Psychology Dept., Albion College, Albion, Mich.).

Three groups of Ss read a 5-paragraph story. One group read the middle paragraph under conditions of .2-sec. DAF. The other 2 groups functioned as control groups. Both an immediate and a delayed oral recall were obtained. The usual changes in reading rate were observed. Immediate memory for the material presented under DAF were severely impaired. Delayed retention showed a marked relative increase, but not enough of an absolute increase to eliminate the significant difference between the experimental and the control groups.

R 9

26,027

Nelson, T.M. & Bartley, S.H. THEORETICAL INTERPRETATION OF VARIOUS QUALITATIVE AND QUANTITATIVE ASPECTS OF FLICKER AND FUSION PHENOMENA. *J. Psychol.*, Jan. 1965, 59 (First Half), 185-194. (Psychology Dept., Michigan State University, East Lansing, Mich.).

This paper is a theoretical interpretation of the general facts interrelating critical flicker frequency or CFF, the length of the pulse train, and the interval of separation between pulse trains; also theoretical predictions are made covering stimulus conditions not yet investigated. The interpretive framework employed is known as the alternation-of-response theory. The theory consists in a set of statements describing how intensive, durational, and distributional features of photic input are (or may be) utilized by the visual system. It is based upon the premise, empirically derived, that the cortical processes control CFF and brightness and that certain temporal distributions of cortical activity are necessary (although not sufficient) to explain discriminations of edge, size, hue, and saturation.

R 10

26,028

Nelson, T.M., Bartley, S.H. & Bochniak, F. FLASH FREQUENCY WHEN BRIGHTNESS IS VARIED BY MANIPULATION OF THE TEMPORAL DISTRIBUTION OF PHOTIC INTERMITTENCY. J. Psychol., Jan. 1965, 59(First Half), 195-205. (Psychology Dept., Michigan State University, East Lansing, Mich.).

Various workers have shown that in intermittent stimulation response rate and input rate often do not tally. The rate of flashing or flickering is not generally as high as the photic pulse rate. The present study investigates this difference between flash rate and input rate. It is easy to quantify this discrepancy when input rate is low, but when higher rates are used direct counting of flashes per unit time becomes impossible. The method used in this experiment was a matching of flashes and auditory ticks, with the supposition that the number of ticks per unit time gives a measure to compare with the pulse rate. 3 Ss were used. 6 stimulus rates were matched under each of 4 PCF (pulse to cycle fraction)-intensity conditions. CFF was determined for each PCF and level of intensity. The rate was then lowered to the point at which the photic input produced the appearance of regular flicker. The interval between this upper value & 10 cps was divided by 3. The 3 rates resulting were used for matching. To report a match the sound-and-flash trains had to appear to accompany one another. The results confirm the discrepancy between flash rate and photic pulse rate. Throughout a large range of pulse frequencies flash rate per stimulus rate is nearly constant. The results are further discussed in relation to previous studies by Bartley and Segal.

R 17

26,029

Rath, G.J. RESEARCH ON THE MANAGEMENT OF RESEARCH AND DEVELOPMENT: INITIAL STEPS TOWARD STUDIES OF THE INFORMATIONAL BEHAVIOR OF SCIENTISTS AND ENGINEERS. Report from: "Information Systems Sciences: Proceedings of the Second Congress, 1965, 435-445. John Wiley & Sons, Inc., New York, N.Y. (Industrial Engineering Dept., Northwestern University, Evanston, Ill.).

Researchers' informational needs is the subject of this paper which samples the literature in the area, discusses some research problems, and illustrates the type of man/machine interface which might be designed and built. (HEIAS)

R 26

26,030

Kintz, B.L. & Zaffy, Donna J. SHORT-TERM AND LONG-TERM RETENTION AND TASK DIFFICULTY. J. Psychol., Jan. 1965, 59(First Half), 229-232. (Psychology Dept., Ohio University, Athens, Ohio).

40 Ss were required to learn two lists of paired associates (an "easy" list and a "difficult" list). A modified anticipation method allowed measures of short-term and long-term retention to be taken. The mean retention intervals for LTR were 44 seconds for the easy list and 36 seconds for the difficult list. For both lists, the retention interval in STR was 2 seconds. The mean proportions of items correctly recalled during the trials to reach criterion were .95 and .94 for the easy and the difficult items respectively under STR; and .76 and .60 for the easy and the difficult items respectively under LTR.

R 5

26,031

Chandler, K.A. & Ehmer, Marjy N. THE EFFECT OF MONOCULAR LIGHT STIMULATION UPON THE PERCEPTION OF THE BODY MIDLINE: A DEVELOPMENTAL STUDY. J. Psychol., Jan. 1965, 59(First Half), 233-242. (School of Medicine, Yale University, New Haven, Conn.).

Changes in the perception of the body midline due to monocular light stimulation and starting position of the tactual stimulus are reported for 4 different age groups. S was examined in the supine position with his eyes closed and with goggles (used to effect monocular light stimulation) in place, following the determination of the physical midline. S was asked to indicate on all trials when he felt he was being touched in the middle of his body. E (depending upon experimental conditions) would touch S in successive 2 mm steps starting from either the left or the right side and would proceed toward the midline, about 1.5 inches above the navel. 2 conditions of starting position (left and right) and 3 conditions of ocular stimulation (left eye, right eye, and no stimulation) were employed. 134 Ss were examined in 4 age groups: a) 7-8 year old children; b) 11-12 year old children; c) young adults average age 24; d) elderly adults average age 68. In general, the effects are a function of age, sex, and the nature of the stimulus. The magnitude of directional shifts in the perceived midline is greatest at ages 7 and 68 and least at age 20. The direction of change is consistently toward the side of stimulation. At early ages females are clearly more influenced than males by the visual and tactual stimulus variables. Such findings are viewed within an organismic developmental framework.

R 11

26,032

Bleck, F.C. & Craig, E.A. BRIGHTNESS ENHANCEMENT AND HUE: I. THE EFFECT OF MUNSELL-HUE TARGETS. J. Psychol., March 1965, 59(Second Half), 243-250. (Psychology Dept., Lehigh University, Bethlehem, Penn.).

5 Ss made brightness matches between achromatic targets under steady illumination and chromatic (Munsell-hue) targets under intermittent illumination. By means of neutral-density filters, the S's task was to adjust the luminous intensity of the steady target until it was judged equal in brightness to that of the intermittent target. Each of the 10 Munsell standard hues and the achromatic chip (all of the same luminous reflectance) was presented as an intermittent target at each of the 6 rates tested (3, 9, 15, 21, 27, 45 cps). Each S made 4 matches for each hue and for the achromatic chip at each flicker rate--a total of 264 matches. Hues were presented randomly for each flicker rate, and the order of flicker rates was random for each S. It was found that targets equal in luminous reflectance vary in brightness as a function of both intermittency rate and spectral characteristics. At all rates of intermittency, minimum points were found near Munsell designations GY and P; maximum points, near R and B. Interpretation is suggested in terms of Bartley's alternation-of-response theory and Granit's dominator-modulator theory.

R 7



26,033

Bleck, F.C. & Craig, E.A. BRIGHTNESS ENHANCEMENT AND HUE: II. HUE SHIFT AS A FUNCTION OF STEADY AND INTERMITTENT PHOTIC STIMULATION. *J. Psychol.*, March 1965, 59(Second Half), 251-258. (Psychology Dept., Lehigh University, Bethlehem, Penn.).

Hue shifts under changes of steady light intensity (Bezold-Brucke effect) were compared with hue shifts under 6 rates of light intermittency. The same 5 Ss made hue matches between pairs of Munsell-hue targets when: a) both targets were steady; b) one was steady and the other was at an equal-brightness level of intermittent light; c) one was at a low steady level and the other at a higher steady level; and d) one was at a low steady level and the other at a higher intermittent level. The higher levels for (c) and (d) were equal in brightness. Similar hue matches were made under both steady and intermittent conditions when the 2 targets were equal in brightness. Hue shifts comparable in amplitude and direction are found for steady conditions, as compared with intermittent conditions, when the 2 targets differ equally in brightness. Because steady and intermittent hue shifts are similar, both may reflect the same underlying physiological processes. Tentative interpretation is suggested in terms of Granit's dominator-modulator theory.

R 6

26,034

Ceraso, J., Schiffman, D. & Becker, B. RECALL INTERFERENCE IN RETROACTIVE INHIBITION. *J. Psychol.*, March 1965, 59(Second Half), 259-265. (Psychology Dept., Yeshiva University, New York, N.Y.).

2 experiments were performed to study recall interference in a retroactive-inhibition design. The design involved comparing the retroactive inhibition produced by N trials on the same interpolated list (One L) with the retroactive inhibition produced by N different lists, each list learned for a single trial. 108 Ss participated in Exp. I and 96 Ss participated in Exp. II. The results of both experiments showed no difference in the amount of retroactive inhibition produced by the 2 conditions when recall was tested immediately after interpolated learning. For 24-hour recall, both experiments showed greater retroactive inhibition for the One L Group as compared to that for other groups, but the effect was statistically significant in only 1 experiment. The major conclusion reached was that recall interference increases over time and affects the first list as well as the second list in a 2-list interference experiment.

R 6

26,035

Brown, D.W. & Fox, G.H. THE EFFECT OF OBSERVER REDUNDANCY AND TASK DIFFICULTY ON DISPLAY-MONITORING EFFICIENCY. *J. Psychol.*, March 1965, 59(Second Half), 267-274. (Applied Research Lab., Sylvania Electronic Systems, Waltham, Mass. & Psychology Dept., Northeastern University, Boston, Mass.).

The study investigated speed and reliability of performance by pairs of human operators as a function of operator redundancy and task difficulty. 8 pairs of Ss responded to all 8 combinations of redundancy (redundant and nonredundant), stimulus complexity (4 or 8 critical stimuli) and critical time duration (1 or 2 sec.). The stimuli consisted of pairs of lights in a 4 by 3 matrix. 12 reaction times to critical stimuli were obtained for each pair of Ss for each of the experimental conditions. Results substantiated the hypotheses that RT decreases with decreasing task difficulty and that the nonredundant situation produces a lower RT than does the redundant condition. A series of predictions concerning positive errors (false responses) and negative errors (missed signals) were tested. In general, it was found that redundant operation results in fewer negative errors than nonredundant operation for tasks of equal difficulty provided that the tasks are relatively difficult. For positive errors, it was found that, given a sufficiently difficult task, nonredundant operation results in fewer errors than does redundant operation.

R 5

26,036

Kintz, B.L. SHORT-TERM RETENTION AND LONG-TERM RETENTION AS A FUNCTION OF PRACTICE. *J. Psychol.*, March 1965, 59(Second Half), 309-313. (Psychology Dept., Ohio University, Athens, Ohio).

Little experimental work has been done relating STR and LTR. In the present study, 3 STR intervals and 3 LTR intervals were used with varying numbers of trials (with recall measures after each trial). The task was an easy paired-associates task (with dissyllables as responses and the first letter of the dissyllable as the stimulus). 3 lists of materials were prepared so that STR and LTR measures could be taken on each list. 24 Ss learned List 1, 22 Ss learned List 2 and 20 Ss learned List 3. Ss were given 6 trials. The first 5 trials provided the STR measures; the last 5 trials provided the LTR measures. The results show that forgetting increases as the retention interval increases, and that forgetting decreases as the number of repetitions increases.

R 4

26,037

Bourassa, C.M. & Bartley, S.H. SOME OBSERVATIONS ON THE MANIPULATION OF VISUAL ACUITY BY VARYING THE RATE OF INTERMITTENT STIMULATION. *J. Psychol.*, March 1965, 59(Second Half), 319-328. (Neurophysiology Lab., Good Samaritan Hospital, Portland, Ore. & Psychology Dept., Michigan State University, East Lansing, Mich.).

The present work evaluates the influence of intermittent stimulation on visual resolution for light targets in a dark surround. The following results obtain: a) when the conditions provide enhancement, visual resolution is adversely affected; b) when brightness enhancement does not occur, resolution depends on target size and luminosity. With small targets, increases in intensity act to decrease acuity; thus small pulse-to-cycle fractions (which allow less light flux than do larger pulse-to-cycle fractions) provide better acuity than do larger pulse-to-cycle fractions. At fusion, the smaller pulse-to-cycle fractions are superior to the larger pulse-to-cycle fractions; and, as pulse rate is decreased (thus increasing brightness) acuity becomes progressively poorer. With larger targets, there is a wide range of luminous intensities over which acuity is relatively unaffected; thus neither pulse rate nor pulse-to-cycle fraction change produce noticeable changes in visual resolution. With larger targets at low intensities of illumination, high pulse-to-cycle fractions provide better visual resolution than do low pulse-to-cycle fractions. As pulse rate decreases, resolution tends to improve.

R 27

26,038

Beer, D.J. REPEATED MEASUREMENTS AND SESSION-SPACING EFFECTS ON CRITICAL FLICKER FREQUENCY. J. Psychol., Jan. 1965, 59(First Half), 11-15. (Psychology Dept., Boston College, Chestnut Hill, Mass.).

Contradictory findings are presented and discussed. Some investigators have concluded that CCF is an inherent and stable characteristic of the individual whereas others have found that individual variability in CCF is not a particularly stable trait, either for various conditions on the same day or for various conditions on different days. This experiment was designed to evaluate the effect of session replication and the effect of the duration of the interval between sessions on CCF. 3 groups (10 Ss each) different in the methods of spacing sessions were tested for 10 sessions. Group I Ss were tested for all 10 sessions in the same day, with a 2 minute rest period between each session. Group II Ss were tested in 5 sessions on the first day and in 5 sessions on the fifth day. Group III Ss were tested in 2 sessions a day for 5 consecutive days. A significant interaction effect was observed between interval durations and session replications. The group that was tested daily for 5 consecutive days showed a consistent elevation in threshold after the first 2 sessions, while the other 2 groups showed relatively uniform threshold scores over the 10 sessions.

R 11

26,039

Jackson, Janice M. VARIABILITY IN VISUAL THRESHOLDS. J. Psychol., Jan. 1965, 59(First Half), 17-28. (Psychology Dept., Fordham University, New York, N.Y.).

This investigation studied variability in visual thresholds for 6 Ss for 50 consecutive days. Within each session, 50 threshold determinations were obtained by the ascending method of limits. The criterion for threshold was "the first visible flash." The results show the following: a) Session-to-session variability agrees closely with the variability estimates made by Hecht and Zegers; b) No periodic or cyclic trends appeared for the group or for any individual subject; c) For all 6 Ss for the first 15 days of testing, a learning phenomenon was observed for the mean and standard-deviation data. There was a slow rise over the last 10 days of testing for the mean, but not for the standard-deviation data. (A discussion of the possible causes of the rise of the mean over the last 10 days suggested the influence of extraneous factors, such as boredom and fatigue.); d) No effect of the menstrual cycle upon the threshold values was found.

R 9

26,040

Yakubovich, V.A. MACHINES THAT CAN LEARN TO RECOGNIZE PATTERNS. FTD TT 65 148/1+2, May 1965, 45pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Kafedra Vychislitel'noy Matematiki i Vychislitel'nyy Tsentr. Metody Vychisleniy (Russian), 2, 1963, pp95-131). (AD 618643)

This paper is a discussion of machines that can simulate the work of that part of the cerebral cortex that supervises organization of impressions and processes the elementary ideas associated with the process of pattern recognition. The approach here deals with the classification of objects by an attribute or program not previously given. The perceptron is described and defined mathematically. The recognition mode of the perceptron, the recognition unit, is next considered in mathematical detail relative to appropriate engineering design principles. Also the learning unit of the perceptron is defined by function. Experiments are described for recognition of: convex and concave functions, handwritten numbers, profiles, and vowel phonemes.

R 12

26,041

Whiteman, G.L. COMMUNICATION AND DRIVING SAFETY: THE ROLE OF MASS MEDIA AND THE EFFECTS OF POSITIVE AND NEGATIVE SYMBOLISM IN ACCIDENT PREVENTION. (M.A. Thesis presented to Faculty, University of Oklahoma, Norman, Okla.). 1965, 114pp. Graduate College, University of Oklahoma, Norman, Okla. (AD 618546)

In the first 5 chapters of this report the author analyses the role of the mass media in traffic safety. The specific topics discussed are the following: a) Principles of Mass Communications; b) Goals of Mass Communications for Safety; c) The President's Committee for Traffic Safety; d) The Role of Mass Media in Accident Prevention; e) Activities of the Mass Media in Accident Prevention. In this section the author repeatedly emphasizes the need for communication dealing with how accidents may be prevented rather than simply stressing the danger without offering any driving "tips". The last 3 chapters investigate the most effective type of motivation in accident prevention campaigns: f) Attitudes and opinions for Traffic Safety; g) The Value of Scare Techniques in Accident Prevention; h) The Value of Slogans in Accident Prevention. The author concludes that "scare" techniques are often used inadvisedly and that they may do more harm than good. (HEIAS)

R 95

26,042

Wood, C.D., Graybiel, A., McDonough, R.G. & Kennedy, R.S. EVALUATION OF SOME ANTIMOTION SICKNESS DRUGS ON THE SLOW ROTATION ROOM (NO. 1). Contract NASA Order R 93, BuMed Proj. MR005.13 6001, Subtask 1, Rep. NSAM 922, March 1965, 13pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (AD 617755)

A series of antimotion sickness drugs was evaluated on the human centrifuge at the Navy School of Aviation Medicine. 15Ss with normal semicircular canals based on the threshold caloric test were exposed to a total of 168 experimental trials in the Pensacola Slow Rotation Room under standardized conditions. One hour before each trial they received a capsule which contained either a placebo or drug. They were stressed to the point where definite symptoms of motion sickness appeared or until a cut-off point was reached. The procedures used enabled the same stimulus to be applied to the individual subjects through the series of drug tests. A combination of hyoscine and d-amphetamine was found to be the most effective preparation. Hyoscine alone was the most effective single drug followed by d-amphetamine and meclizine. Prochlorperazine was slightly effective, but chlorpromazine, thiethylperazine, and trimethobenzamide were ineffective. Hyoscine alone produced pronounced drowsiness. The combination with d-amphetamine relieved this side effect but not the vertigo and dry mouth. The advantages of the human centrifuge in the testing of antimotion sickness drugs are pointed out.

R 19

26,043

Weinwurm, G.F. THE MANAGEMENT OF INFORMATION PROCESSING. Report from: "Symposium on Economics of Automatic Data Processing, International Computation Centre, Rome, Italy, October 19-22, 1965." SP 1992/000/01, July 1965, 36pp. System Development Corporation, Santa Monica, Calif. (AD 619019)

The measurement of economic activity and value naturally rests on the availability of reasonably precise and generally available definitions of the types of tasks to be undertaken, and standards by which their performance can be compared. The greatest difficulty in managing information processing at present is simply that such definitions and standards either do not exist or are not generally accepted. Those delineations of information processing tasks that are common to the literature have evolved in response to the needs of diverse disciplines--such as accounting, computer programming, control engineering, etc.--under dissimilar conditions, and have not been related in any meaningful way. The present paper is in 4 parts. The 1st part presents some inherent difficulties in resolving these different viewpoints toward the end of developing measures and standards for management in the field of information processing. The 2nd part considers the notion of "real time" as an example of a terminological problem, and the difficulties that are apparent in using the term as a means of classifying systems. The 3rd part suggests an alternate way of describing the relation of information processing tasks to a dynamic environment. The 4th part summarizes the point of view of the paper.

R 31

26,044

Wright, D.I. APPLICATIONS OF INDUSTRIAL ENGINEERING IN THE UNITED STATES AIR FORCE. A STUDY. (M.S. Thesis, Industrial Engineering School, Georgia Institute of Technology, Atlanta, Ga.). March 1965, 58pp. Georgia Institute of Technology, Atlanta, Ga. (AD 614674)

The objectives of this study were: to investigate and analyze AF utilization of officers educated in Industrial Engineering (IE); to investigate and determine the extent to which IE methods, techniques, and procedures are applied in relevant areas here; and to determine the extent to which AF Institute of Technology - sponsored IE educational programs prepare officers for work in such areas. A questionnaire was constructed and administered to 164 AF officers. The following qualified conclusions (in view of the subjective nature of the responses) were drawn: officers in IE education programs require additional direction and guidance in formulating their study programs; those receiving IE degrees are adequately prepared for most specialty assignments; a significant number with degrees are not being optimally utilized; the potential of this field is not sufficiently recognized within the AF; those who receive education in other fields are better suited for some of the specialties IEs are assigned; and the use of IE methods and techniques is related to individual initiative and attitudes of superiors. (HEIAS)

R 4

26,045

Vasil'yeva, V.M. CHANGES IN THE ELECTROENCEPHALOGRAPH AND DERMA-GALVANIC REACTIONS IN THE PROCESS OF FORMATION OF TENTATIVE RELATIONSHIP BETWEEN MOTORIAL AND VISUAL ANALYZERS IN HUMANS. FTD TT 65 434/1+2, June 1965, 12pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Zhurnal Vysshey Nervnoy Devatel'nosti. (Russian) 1964, 14(5), 755-762. (AD 615995))

A pairing was made of the kinesthetic and photic stimulations in man with a view of forming a temporary connection between the motor and visual analysers. Proprioceptive stimulation was achieved by the movement of the muscles, provoked by stimulation of the ulnar nerve through the skin by threshold impulses of a rectangular current not accompanied by tactile effect. After several pairings of the stimuli a conditioned EEG response was elaborated: the movements of the muscles resulted in the same depression of the alpha-rhythm in the occipital area as the photic stimulations paired with them. The dynamics of EEG and SGR changes in the course of formation of such a reaction is characterized by a number of regularities inherent in temporary connections between exteroceptive stimuli.

R 20

26,046

Triolo, D.A. & Jadico, T.G. HUMAN FACTORS COMPARISON OF THREE TYPES OF SMALL ARMS SIGHTS. Contract AMCMS 5522.11.080, DA Proj. 1C522301A080, Memo Rep. M65 21 1, May 1965, 16pp. USA Frankford Arsenal, Philadelphia, Penn. (AD 619055)

This report includes a description of the sights and weapons used, the type of lighting and target conditions, range, and the method used for testing. The problems of sight alignment with the short base reflecting tube sight are discussed. Tables of results are included in an appendix. A short base reflecting tube sight containing cross hairs, and a short base open notch and blade sight were constructed and mounted on rifles. They were fired for score for a general comparison as against that of a conventional long base peep sight, and to determine which of the short base sights were more effective. 10 Ss fired the short base reflecting tube sight, the short base open notch and blade sight, and a conventional long base peep sight alternately for score under different lighting and target conditions. The extreme spread of the shot groups obtained with each sight and the sight and fire time for each round fired were measured and the data recorded. The conventional long base peep sight showed the best results. The Ss found it difficult to obtain sight alignment with the short base reflecting tube sight. The shot groups and firing times with the short base open notch and blade sight were significantly better than those obtained with the short base reflecting tube sight.

26,047

Smith, R.G., Jr. CONTROLLING THE QUALITY OF TRAINING. Contract DA 44 188 ARO 2, Proj. 2J02401A712 01, Tech. Rep. 65 6, June 1965, 52pp. Human Resources Research Office, George Washington University, Alexandria, Va. (George Washington University, Washington, D.C.). (AD 618737)

This presentation is based upon a survey of the literature and draws, in particular, upon HumRRO experience in research studies relating to quality control. The main sections of the report deal with a description and critique of the most common methods of training evaluations, considerations in the development and use of proficiency tests, and factors that are necessary to success in operating a quality control system. It is stated that the purpose of quality control is to ensure a satisfactory standard of competence among the students who graduate, to maintain this quality by a continuous monitoring process, and to improve training where it is found to be deficient. In order to function successfully, a quality control system should constitute a separate unit, independent of, but cooperating with the instructional departments. Attention is given to proficiency testing as the chief means of measuring the success of the training program, with emphasis upon the importance of a uniform standard and consistent method in the preparation, administration, and scoring of tests.

R 55

26,048

Rasch, P.J. & Brown, M. A CRITICAL ANALYSIS OF THREE PHYSICAL FITNESS TESTS. BuMed Proj. MF022.01.04 8002.2, Rep. 2, July 1965, 22pp. USN Medical Field Research Lab., Camp Lejeune, N.C. (AD 619092)

The purpose of this investigation was to evaluate the Initial Strength Test, the Physical Readiness Test, and selected Fleishman tests as measures of the type of physical fitness required by Marine Corps combat troops. It was concluded that none of them were satisfactory for this purpose. There are at present no criteria establishing the type and level of fitness required by such troops. Satisfactory tests cannot be developed until such criteria have been established.

R 34

26,049

Roberts, E.O. EGRESS FROM A SINGLE PLACE CREW STATION IN A WEIGHTLESS ENVIRONMENT. FINAL TECHNICAL REPORT, 1 FEBRUARY 1964-1 APRIL 1965. Proj. 1425, Task 142502, AFFDL TR 65 148, Sept. 1965, 33pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (AD 623120)

This technical report presents the results of an in-house test program to establish design criteria for crew stations as related to crewmember egress from a single place pilot's station in a weightless environment. The objectives were to investigate the egress problems associated with the panel layout of a minimum volume crew station and to establish optimum location of an overhead hatch for crewmembers wearing regular flight suits during an emergency egress conditions. A simulated single place crew station was designed and fabricated in-house and mounted in the Aeronautical Systems Division's zero gravity aircraft. An overhead hatch bulkhead was designed to be adjustable which allowed the egress task to be performed at different locations from the seat reference point (SRP). 3 hatch locations were used. In the 1st series of tests the hatch opened outward from the crew station and was tested at the 3 locations; in the 2nd series the hatch was tested at the maximum distance from the SRP but opened inward. 3 times were recorded for the egress task; RT, egress to the hatch, and egress through the hatch. 3 Ss were used to give 6 replications for each hatch location. The data were statistically analyzed using F ratio and t tests and the results indicated that egress through an inward opening hatch took 1 1/2 to 2 times longer than to egress through the hatch that opened outward. The time required to egress to the hatch proved to be what would be expected; the time increased as the hatch distance to the SRP increased. The panel layout, however, did have an effect of reducing the time required to egress through the hatch as the bulkhead was relocated to greater distances from the crew station.

R 4

26,050

Simons, D.G., Prather, W. & Coombs, F.K. THE PERSONALIZED TELEMETRY MEDICAL MONITORING AND PERFORMANCE DATA-GATHERING SYSTEM FOR THE 1962 SAM-MATS FATIGUE STUDY. Task 775506, SAM TR 65 17, April 1965, 29pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 467733)

This report describes the instrumentation used for gathering and recording data for the 1962 USAF SAM-MATS, Fatigue Study at Dover AFB, Del. 6 biomedical measures and 6 performance measures were recorded continuously while 4 pilots accomplished an aircraft simulator "flight" of 24 hours each. The biomedical monitoring instrumentation included EEG, ECG, respiration, skin temperature, BSR, and GSR. A 6-channel personalized biomedical radio telemetry system was used to transmit these measures. Continuously recorded performance measures included 3 pilot-control functions and 3 aircraft instrument readings. The circuitry and functions of the personalized telemetry system are detailed, including techniques developed to resolve all major problems encountered. Most of the recorded data were suitable for visual pattern analysis.

R 16

26,051

Sommer, H.C. & Hille, H.K. ACOUSTICAL EVALUATION OF X-20A DYNA-SOAR FULL-PRESSURE SUIT ASSEMBLIES. FINAL REPORT. Proj. 7231, Task 723103, AMRL TR 65 86, May 1965, 23pp. USA Biophysics Lab., AMRL, Wright-Patterson AFB, Ohio. (AD 618715)

This report presents comparative acoustical data for the "training" model and the "flight-ready" model of the Dyna-Soar X-20A full pressure suit assemblies. For each model the acoustical protection was determined: a) from the subjective measurements of Real-Ear Attenuation at Threshold (REAT) for pure tones; and b) from the objective measurement of transmission loss for wide band noise as recorded outside and inside the helmet at the lip microphone and ear cup positions. Evaluation of the data as measured by the REAT method showed that the training models provide more attenuation than the flight-ready model at the higher frequencies which is the result of a better seal between the ear cup and skull in the training model. The measurement of the transmission loss showed little difference between the 2 models of the suit assemblies. On the basis of calculated noise levels in the command module of the Dyna-Soar X-20A vehicle, no reduction in speech transmission and reception by the environmental noise is expected for either model.

R 4

26,052

Ricciardi, C.A. THE INFLUENCES OF SEPARATIONS AND LUMINANCES OF NEIGHBORING INDUCING FIELDS UPON THE FOVEAL CRITICAL FLICKER FREQUENCY. (M.S. Thesis presented to Faculty, Graduate School, Indiana University, Bloomington, Ind.). Sept. 1965, 43pp. Indiana University, Bloomington, Ind.). (AD 618697)

The following effects on the cff of a foveal test field are found when the distance between the test field and an annular surround is increased: a) low luminance surrounds reduce cff. The reduction decreases with distance of the annulus from the test field; b) high inducing luminances increase cff. This effect also diminishes with distance; c) the points of cff maxima shift toward higher inducing luminances as separation of annulus from test field is increased; d) the cff maxima decrease in value. The shifts in the cff maxima are interpreted as a progressive delay in the onset of lateral inhibitory interaction within the retina as the distance of the inducing field (annulus) from the test field is increased. This delay cannot be compensated for by the higher inducing luminances. The effects of lateral interaction are well-defined for contiguous surrounds, through a wide range of inducing luminances. The degree of retinal interaction drops sharply at all levels of inducing luminance, as the distance between the foveal test field and the inducing surround is increased.

R 48

26,053

Svaeri, O.W. EVALUATION OF 200-PERSON SHELTER (VENTILATION). OCD Work Order OS 63 148, PSDC TR 6, April 1965, 50pp. USA Protective Structures Development Center, Fort Belvoir, Va. (AD 615640)

Observations were made of the thermal environment in the basement portion of a box shaped reinforced concrete 200 person shelter when it was supplied with a minimum quantity of ventilation air. This air supply simulated a 1% design day in the Washington, D.C. area. Approximately 100 simulated occupants were placed in the shelter. When the air was supplied at a rate of 3 cfm per person, effective temperatures rose to 90°F; based on current standards this did not provide adequate cooling. Ventilation air was delivered to the shelter through a single point source and through a direct system. Temperature stratification was as much as 4" between opposite sides with the former; and about 1 to 2" with the latter system. It was concluded that ventilation air supplied at the 3 cfm rate was inadequate to maintain a tolerable thermal environment in the shelter. (HEIAS)

R 4

26,054

Ruocco, J.N., Vitale, P.A. & Benfari, R.C. KINETIC CUEING IN SIMULATED CARRIER APPROACHES. FINAL REPORT-JUNE 1963-JANUARY 1965. Contract N61339 1432, Proj. 7588, NAVTRADEVEN 1432 1, April 1965, 91pp. USN Training Device Center, Port Washington, N.Y. (Grumman Aircraft Engineering Corporation, Bethpage, N.Y.). (AD 617689)

Pairs of matched pilots were trained using a flight simulator in a carrier-landing maneuver under 2 conditions--kinetic and static. The 2 conditions were identical, except that in the kinetic mode cockpit motion was provided. Kinetic cueing significantly improved performance in terms of percentage of successful landings, altitude error, time outside the flight path, and variability of pilot inputs. The statically trained group showed a decrement in performance which persisted throughout training and transferred to the criterion flights which involved cockpit motion. Results clearly indicate that kinetic cueing is a valuable and desirable adjunct to flight airborne simulation systems. Evidence indicates that kinetic cueing serves as a general alert rather than as a source of specific information for the pilot. Also included in this report are annotated references representative of the pertinent motion cues literature in the areas of training, vehicle landing characteristics, human operator processes, and motion dynamics and vehicle simulation fidelity.

R 22

26,055

Reber, E.F., Raheja, K. & Davis, Dorothy. COMPILATION OF A BIBLIOGRAPHY ON THE WHOLESOMENESS OF IRRADIATED FOODS. Contract DA 49 193 MD 2571, ca. 1965, 25pp. USA Research & Development Div., Office of the Surgeon General, Washington, D.C. (University of Massachusetts, Amherst, Mass.). (AD 614910)

The Department of Food and Nutrition of the University of Massachusetts has compiled a bibliography of 281 items dealing with the wholesomeness of irradiated foods. The specific topics included are the following: a) Selected General Review Papers on the Wholesomeness of Irradiated Food; b) Wholesomeness of Irradiated Food: Long-term (2 yrs.) studies: (1) Bacon; (2) Beans; (3) Beef; (4) Cabbage; (5) Carrots; (6) Chicken; (7) Cod Fish; (8) Corn; (9) Eggs; (10) Fruit Compote; (11) Milk; (12) Oranges; (13) Peaches (14) Pork; (15) Potatoes; (16) Shrimp; (17) Tuna; (18) Wheat Flour; c) Food and Drug administration actions; d) Wholesomeness of Irradiated Foods: Short-term Studies; e) General Papers on Wholesomeness; f) Carcinogenicity; h) Hemorrhagic Diathesis; i) Effect of Irradiation on Enzyme Systems; j) Nutritive Value of Irradiated Food--Proteins; k) Nutritive Value of Irradiated Food--Lipids; l) Vitamin Destruction in Pure Solution and in Foods--General; l) Studies in Nutritional and Biochemical Effects of Irradiation; m) Unclassified Papers. (HEIAS)

26,056

Ruocco, J.N., Vitale, P.A. & Benfari, R.C. KINETIC CUEING IN SIMULATED CARRIER APPROACHES. SUPPLEMENT I. STUDY DETAILS. FINAL REPORT-JUNE 1963-JANUARY 1965. Contract N61339 1432, Proj. 7588, NAVTRADEVEN 1432 1 S1, April 1965, 196pp. USN Training Device Center, Port Washington, N.Y. (Grumman Aircraft Engineering Corporation, Bethpage, N.Y.). (AD 618756)

This volume is a supplement to No. 26,054. It contains detailed information on the equipment used, on the experimental design and on the reduction of data. (HEIAS)

26,057

Rush, P.J. DEVELOPMENTS IN PROTECTIVE SHELTER SYSTEMS. Proj. Y F011 05 02 303, Tech. Rep. 357, April 1965, 129pp. USN Civil Engineering Lab., Port Hueneme, Calif. (AD 614979)

This report covers available information on protective and environmental aspects as they apply to design, construction, and operation of shelter systems for the survival of personnel and equipment. More than 400 references were studied to compile the report. Certain of the information was obtained from observations of nuclear detonations and their effects upon various components of shelter systems; other data included are the results of laboratory experiments; and some conclusions were derived from analytical considerations.

R 40

26,058

Pask, G. TEACHING AS A CONTROL-ENGINEERING PROCESS. Control & Automation Progress, Jan. 1965, 2(79), 6-11. (System Research Ltd., Richmond, England). (Reprint). (AD 618003)

In part 1 (part 2 will appear subsequently) of this article the field of teaching machines is reviewed with particular emphasis on adaptive systems, or systems in which the teaching machine is an adaptive control mechanism. The purpose of this review is to indicate the kind of machinery that exists, the kind of work that is being done, and briefly, the results that have been achieved. Several examples of such adaptive machines are described--the Saki machine, an adaptive comprehension trainer, and an adaptively controlled group-teaching system--together with their strategies. (HEIAS)

R 28

26,059

Pomaroli, R.S. & Ambler, Rosalie. VOLUNTARY WITHDRAWAL FROM PRIMARY FLIGHT TRAINING AS A FUNCTION OF THE INDIVIDUAL FLIGHT INSTRUCTOR. Spec. Rep. 65 2, May 1965, 6pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (AD 615248)

This study explored various aspects of the flight instructor-student relationship to determine whether or not some flight instructors are involved in significantly higher voluntary drop-out (DOR) rates among their students than are other instructors. The instructor sample was selected from the Naval Primary Flight Training Squadron. It was demonstrated statistically that the distribution of DOR's among instructors was not significantly different from a chance distribution. 3 ancillary approaches (clinical, instructor effectiveness ratings, and instructor academic performance) have provided further support to the above finding by demonstrating that: a) DOR students themselves who have been attributed to particular instructors in a seemingly disproportionate ratio did not cite instruction as a cause of their withdrawal; b) administrator rankings of instructor effectiveness had no significant relationship to DOR production rates; c) the age and academic performance of the instructors themselves while going through instructor training showed no significant relationship to subsequent rates of DOR production. It is recommended that indices other than number of DOR's be used to explore the quality of the flight instructor-student relationship. This would be especially true in any attempt to establish a criterion of instructional effectiveness.

R 1

26,060

Pietrasanta, A.C. FACTORS INFLUENCING THE NOISE EXPOSURE UNDER THE LANDING PATH FOR JET TRANSPORT AIRCRAFT. TECHNICAL REPORT. Contract FA64WA 4949, FAA ADS 39, March 1965, 35pp. US Aircraft Development Service, FAA, Washington, D.C. (Bolt Beranek & Newman Inc., Van Nuys, Calif.). (AD 617765)

On the basis of available acoustical data calculations have been made to determine the quantitative effect on the noise exposure under the landing path of changes in runway threshold location, glide slope angle, and engine power setting. Each of these factors has been examined independently, i.e., with all other conditions held constant, for operation of a turbofan-powered Convair 990 and a turbojet-powered Boeing 707-120. Changes in noise exposure are described in terms of changes in perceived noise level and/or changes in the area enclosed by equal perceived-noise-level contours for a range in glide slope angles of 1000 ft. and 2000 ft. and 4 different engine power settings from approximately 60% thrust downward. The results can be generalized to apply to essentially all 4-engine commercial jet airliners in operation today. They provide the basis whereby changes in these factors can be evaluated in terms of their effectiveness in reducing noise exposure alone. Further, trading relationships among changes in these factors can be derived from the data.

R 4

26,061

Power, G.G., Jr., Hyde, R.W., Sever, R.J., Hopping, F.G., Jr. et al. PULMONARY FUNCTION IN MAN DURING PROLONGED ACCELERATION. I. DIFFUSING CAPACITY AND BLOOD FLOW. Weptask RAE 13J 012/2021/R005 01 01, Prob. Assign. 012AE13 15, NADC ML 6512, June 1965, 14pp. USN Aviation Medical Acceleration Lab., NADC, Johnsville, Penn. (AD 467142)

The authors studied possible causes of the decreased arterial oxygen saturation seen when a S is accelerated in a centrifuge by measuring simultaneously the pulmonary diffusing capacity,  $DL_{CO}$ , and the pulmonary capillary blood flow,  $Q_c$ , using breathholding techniques with carbon monoxide and acetylene. After 1 min. of +G<sub>x</sub> (forward or eyeballs-in) at 8 times normal gravity, 8 G, average  $DL_{CO}$  decreased 35% from an initial control of 33.7 to 21.5 ml/min. x mm Hg in 4 Ss. Although this decrease was statistically significant, ( $p < 0.01$ ) the values observed were not low enough to indicate that impaired diffusion was a prime cause of arterial unsaturation. Average  $Q_c$  decreased 35% during acceleration from an initial control value of 12.9 to 8.2 L/min. also a significant change ( $p < 0.01$ ). These values may have indicated that total pulmonary blood flow was reduced, but a more likely explanation is that a large portion of pulmonary blood flow perfused non-ventilated regions.  $DL_{CO}$  and  $Q_c$  returned toward initial control levels within 8 min. after acceleration in most instances.

R 22

26,062

O'Neill, J.L. SIMULATION RESEARCH ON NON-IMAGE SENSOR SYSTEMS. Contract Nonr 3818(00), Rep. 352 R 16, July 1965, 22pp. HRB-Singer, Inc., State College, Penn. (AD 617384)

This report describes the preliminary work on model and program design for a computerized, analytical simulation of an ELINT reconnaissance flight over a selected target area. The simulation produces quantitative and statistical inputs to other associated systems with which it is to be integrated and evaluated. Variation of input parameters will produce performance evaluation products. The simulation is based on system specifications and mathematical sub-routines describing physical events and measurements including flight paths, vehicle locations, radiator bearings, line of sight distances, propagation factors, signal attenuation, receiver sensitivities, etc. The concern of the program is with advanced intelligence collection systems capable of operating in any environment and in any spectral or force field region. (HEIAS)

26,063

Oatman, Lynn C. CHECK-READING ACCURACY: ALIGNED DIALS VS. EXTENDED-POINTER DIALS. AMCHS Code 5011.11.841, Tech. Memo. 6 65, May 1965, 24pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 616882)

This experiment compared check-reading accuracy on 2 dial displays: a 12-o'clock aligned dial display and an extended-pointer dial display. A set of black-and-white slides was made to simulate each type of dial display. 30 Ss were presented the 2 dial configurations and asked to indicate whether the display contained a deviant pointer, and, if so, to mark its location on an answer sheet. The data indicate that Ss performed about equally well on the aligned dial display and the extended-pointer dial display. Location of the deviant dial within the dial display was found to be an important determinant of the number of deviant pointers detected.

R 9

26,064

Moore, D.L. MORALE, A SPECIAL PROBLEM REPORT. (M.S. Thesis presented to Georgia Institute of Technology, Atlanta, Ga.). Contract AF 33 608 1063, March 1965, 42pp. Georgia Institute of Technology, Atlanta, Ga. (AD 617081)

This paper is concerned with a literature review on the subject of morale. It presents various definitions of the term and several methods of measuring morale. Some concepts of determining the reliability and validity of the measuring device are also presented. Morale as an independent and dependent variable is discussed and results found in the literature are given. Finally, some discussion is given relative to followthrough on the morale study along with a sample survey.

R 33

26,065

Martinek, H. & Sadacca, R. ERROR KEYS AS REFERENCE AIDS IN IMAGE INTERPRETATION. DA Proj. R&D PJ 2J620901A721, Tech. Res. Note 153, June 1965, 30pp. USA Personnel Research Office, Support Systems Research Lab., OCRD, Washington, D.C. (AD 619225)

The Surveillance Systems Project is directed toward increasing knowledge related to the techniques and procedures for interpreting aerial imagery and reducing extracted information to its most usable form. One Task, specifically concerned with image interpretation displays, conducts research to develop improved reference materials to assist image interpreters in locating and correctly identifying objects of military significance in aerial photographs. Specifically developed reference keys are tested in controlled studies with interpreter output measures as criteria. The present publication describes one of the first such studies. An "error key", developed through analysis of interpreter errors and designed to help interpreters avoid common misidentifications, and a "rights key" similar to keys currently used by image interpreters, were provided to accompany two sets of aerial imagery. Two performance measures based on this imagery were administered to three matched groups of interpreter trainees. One group used the "error key", another group used the "rights key", and a control group used no reference key. Performance data for the three groups--correct identifications, errors, and interpreters' confidence in their identifications--were analyzed. The "error keys" resulted in substantial decrease in errors and increase in accuracy, but no difference in number of correct identifications. They also affected the differential between interpreters' confidence in right and wrong identifications, increasing the amount of difference in one performance measure, and decreasing the amount in the other. The "rights key" did not have a significant effect on any aspect of performance measured.

26,066

Marzolf, J.M. EMERGENCY DISTRESS SIGNALING DEVICES. FINAL REPORT. Contract NRL Problem E01 05, Proj. RR 008 03 46 5675, NRL Rep. 6223, March 1965, 8pp. USN Research Lab., ONR, Washington, D.C. (AD 615153)

A study was made of some of the factors involved in providing suitable emergency distress signaling devices to aid in the location of lost personnel or vehicles. 1 factor particularly considered was a suitable source of electrical power. The magnesium sea-water battery with tunnel diode converter is proposed as being particularly applicable as a power source for marine environments. With the possible exception of size and weight this power source would best meet the following requirements: low cost, reliability, indefinite shelf life, small size and weight, ruggedness, capability of automatic activation, and adequate lifetime for location by search parties. Several typical devices using sea-water batteries with tunnel diode converters were devised, including an audio device to be located by sonar-equipped search vessels, a visual (flashing light) device, and 3 radio transmitters to transmit SOS's or audible tones. Considerations of the 3 radio transmitters indicate a preference for vhf operation. Although developed primarily as distress signaling devices, some of the devices might also be useful as markers for marine buoys or small boats or as navigational beacons.

R 7

26,067

Morris, C.R. WIRELESS MICROPHONE/HEADSET DEVICE (TELEWALK). FINAL REPORT. Proj. 221 140 OIC, Rep. RD 65 20, April 1965, 26pp. US Systems Research & Development Service, FAA, Washington, D.C. (US Communications Development Div., Washington, D.C.). (AD 615953)

This report contains the results of the development and evaluation of a wireless microphone/headset/channel selection device designed to determine the feasibility of replacing the cord-connected headset presently used. These headsets now used by the air traffic controller and coordinator are physically connected by cords to the operating console or position. The cords limit the mobility of the user and interfere with the operation of the control and display equipment. The system developed used very low-powered radio link equipment to provide communication between the controller and his operating position. The results of the development indicate that a wireless system is feasible and desirable for operator comfort and mobility but it is limited in practicability due to cost and marginal reliability. The development was discontinued due to the fact that the requirement for operator mobility has been decreased in the new concept of air traffic control. Recommendations are made to continue efforts to improve the presently used cord-connected headset and operating position.

26,068

Lincoln, R.S. & Mangelsdorf, J.E. AN INTEGRATED APPROACH TO EVALUATING THE PERFORMANCE CAPABILITIES AND PHYSIOLOGICAL STATE OF SPACECRAFT CREWS. Report from: "Symposium on Human Physiological and Performance Determinants of Manned Space Systems Design, San Fernando Valley State College, Northridge, Calif., April 14, 1965." Rep. 6 65 65 15, April 1965, 22pp. Missiles & Space Company, Lockheed Aircraft Corp., Palo Alto, Calif. (AD 616316)

Recognizing the need for a comprehensive crew-monitoring program, the Lockheed Missiles & Space Company has initiated an independent development project concerned with all major aspects of crew monitoring - from the development of measurement techniques to the interpretation of processed data. The objectives of the project are: a) to develop an automatic system to assist in monitoring crew performance capabilities and physiological state; and b) to develop digital techniques for processing, displaying, and analyzing obtained data.

R 3

26,069

Lyapunov, B. COLONIZING OUTER SPACE. FTD TT 64 1181/1+2, April 1965, 10pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Kryl'va Rodiny (Russian), 8, 1964, pp. 23-24). (AD 615230)

This paper suggests the probability of the existence of orbiting manned satellite-stations in the near future of astronautics. Section I is concerned with the question: Why does one need extraterrestrial stations? The major conclusion of this section is that the possibilities of automatic devices are limited; only a man is capable of making an all-around investigation of unusual conditions, and of making decisions in case of some unforeseen change. The following are among the advantageous functions of an inhabited satellite briefly discussed in the article: a) "servicing of the earth" e.g. constant systematic observation of the cloud covering, storms, and other processes in the upper atmosphere; b) The study of the sun, moon, planets, stars and different types of stellar aggregates will be advanced; c) A satellite will be able to execute the function of a navigation radio beacon and retransmitter of radio and television programs; d) It would serve as a laboratory for carrying out experiments under conditions of high vacuum and weightlessness. Section II is entitled "Dwellings in the Ether"---What They Will Be Like. The following are representative of the topics discussed: a) Artificial gravity in living quarters; b) Provision of a greenhouse for long-duration satellite stations; c) Provision of rockets which will make trips to the station; d) Utilization of solar energy. The discussion of Realistic Problems of Modern Technology constitutes the third section. Such topics as Construction Materials, Devices for Protection Against Radiation, and Automation are briefly covered.

26,070

Kryter, K.D. & Williams, C.E. SOME FACTORS INFLUENCING HUMAN RESPONSE TO AIRCRAFT NOISE: MASKING OF SPEECH AND VARIABILITY OF SUBJECTIVE JUDGMENTS. Contract FA64WA 4951, Tech. Rep. FAA ADS 42, June 1965, 70pp. US Aircraft Development Service, FAA, Washington, D.C. (Bolt Beranek & Newman Inc., Cambridge, Mass.). (AD 617935)

Statistics of the variability of subjective judgments of the loudness and noisiness of pure tones and complex sounds as studied in the laboratory and in the field are presented. An analysis of possible sources or causes of this variability is made in terms of test-retest reliability, differences among Ss, type of sounds judged and experimental method used in obtaining judgments. Possible contributions to variability of judgments due to differences in the size of the external ear and the thresholds of auditory sensitivity at different sound frequencies for different age groups are discussed. Word intelligibility tests at various intensity levels were administered to a crew of trained listeners in the presence of recorded noise from jet and propeller-driven aircraft. The noise was that which would be present outdoors and in a house as the result of engine run-up operations and when the aircraft were flying overhead shortly after take-off and prior to landing. Methods of measuring or evaluating aircraft noise predict the results of the speech tests in the following order of merit, from best to worse: a) Articulation Index (AI); b) & c) perceived noise level in PNDB and Speech Interference Level (SIL) (SIL and PNDB appear to predict the masking of speech about equally well); d) Noise Criteria (NC); e) overall SPL, A scale; and f) overall sound pressure level, C scale.

R 10

26,071

Klausner, S.Z. FEAR AND ENTHUSIASM IN SPORT PARACHUTING. Contract AF49(638)992, Proj. 9779 01, AFOSR 65 1329, May 1965, 33pp. US Bureau of Social Science Research, Inc., Washington, D.C. (AD 619 389)

A study is presented on the relation between the experience of fear and the experience of enthusiasm. Fear is assessed by a self-report of fear and by an inference from a projective test about predispositions to fear. Replies to a mail questionnaire by 825 sport parachutists affiliated with 103 parachute clubs constitute the data of this study. Only the jump experience, an analysis of the stories told about one picture in the draw-a-person test, and a few social characteristics are reported.

26,072

Kolesnik, P.E. A COMPARISON OF OPERABILITY AND READABILITY OF FOUR TYPES OF ROTARY SELECTOR SWITCHES. T5 1187/3111, June 1965, 20pp. Autonetics Div., North American Aviation, Inc., Downey, Calif. (AD 617914)

The object of this study was to compare operator performance with four types of rotary selector switches. They included a conventional fixed-scale, moving-pointer switch and three types of fixed-pointer, moving-scale designs - one exposing a single digit, one exposing three digits, and one continually exposing 10 digits. Specific parameters investigated were speed and accuracy of control positioning, and accuracy of reading under four limited exposure times. In addition, each subject ranked the four types of controls according to the degree of difficulty he encountered in using them. It was concluded that moving-scale switches are superior to fixed-scale switches, where accuracy of reading is more important than speed of setting. The moving-scale switch with three digits exposed was recommended over moving-scales with one and ten digits exposed, because of its relative advantages in speed of setting, accuracy of position reading, and subjective positioning preference. A hybrid switch was suggested for development that would incorporate the outstanding features of both the fixed-scale and the moving-scale (3 digits) switches.

R 9

26,073

Holmes, A.E. DESIGN, FABRICATION AND INSTALLATION OF SIX-DEGREE-OF-FREEDOM SPACE MAINTENANCE SIMULATOR. FINAL REPORT. Contract AF33(615) 1250, Proj. 8170, Task 817008, AFAPL TR 64 129, April 1965, 89pp. USAF Aero Propulsion Lab., Wright-Patterson AFB, Ohio. (Martin Company, Baltimore, Md.). (AD 617423)

A 6-degree-of-freedom-space maintenance simulator was designed, fabricated and installed for USAF Aero Propulsion Lab., WPAFB. The simulator supports a 180 lb S and 110 lb back pack with unlimited freedom in pitch, roll, and yaw; horizontal translation on frictionless air pads over a 20 x 30 ft floor; and vertical translation on air bearings  $\pm 18$  in. from a nominal position. Also, included was a servo controlled work panel capable of horizontal translation simulating a 3K to 7K lb object in orbit. The work panel is suspended from a 20 ft span bridge crane with both axes controlled by servo amplifiers housed in a single rack. A 140 SCF air tank provides a low rate air spring for vertical translation.

R 6



26,074

Hartzler, V.L. & Roccaforte, P.A. EXPERIMENTAL DETERMINATION OF HUMAN VESTIBULAR SYSTEM RESPONSE THROUGH MEASUREMENT OF EYEBALL COUNTERROLL. (M.S. Thesis presented to Faculty, Engineering School, Air University, Wright-Patterson AFB, Ohio). Rep. GE/EE/65 11, ca. July 1965, 35pp. USAF Institute of Technology, Air University, Wright-Patterson AFB, Ohio. (AD 618416)

An indirect measurement of the human vestibular system response was obtained through the measurement of eyeball counterroll. Human Ss were rotated about an axis through their line of sight at angular velocities varying from 0-30 rpm. The right eye was photographed and the angle of an eyeball counterroll was determined by an optical correlation process. A mathematical model was formulated using Fourier curve fitting techniques. This model indicated that Ss with normal vestibular function demonstrate and eyeball counterroll which is a function of angular velocity and position with respect to the vertical. Ss with known vestibular defects demonstrated a small counterroll.

R 15

26,075

Hallett, J. AN ELECTROLUMINESCENT CROSSED-GRID DISPLAY. FINAL REPORT. Contract AF 30(602) 3081, Proj. 559701, RADC TOR 64 362, March 1965, 72pp. USAF Displays Techniques Branch, RADC, Griffiss AFB, N.Y. (Sylvania Electronic Systems, Waltham, Mass.). (AD 615505)

The organization and performance of an electroluminescent crossed grid display system has been studied and an experimental model has been constructed demonstrating the basic concepts developed during the study. This work is based on using a display panel that does not have integral storage; thus a buffer memory is included to minimize the load on the computer data-source, and to periodically refresh the displayed information. It is indicated that an image organized magnetic core memory is most suitable for this system. Both semiconductor and magnetic circuits were investigated for driving the display, and magnetic circuits were found to provide superior performance and advantages. An improved technique for display panel construction permits construction of a large display surface from a number of individual modules. The experimental model has an 8 by 8 in. display with 16 line per in. resolution. An entire image may be erased and replaced with an entirely new image in less than 1 frame (1/30 sec.). Brightness is about .8 ft-L for an average contrast ratio of about 20:1 and is independent of the density of displayed information. The techniques used are compatible with future use of light amplifiers or improved EL materials to provide increased brightness.

26,076

Hyde, A.S. & Raab, H.W. A SUMMARY OF HUMAN TOLERANCE TO PROLONGED ACCELERATION. AMRL TR 65 36, Feb. 1965, 34pp. USAF Biophysics Lab., Wright-Patterson AFB, Ohio. (AD 615570)

Human S tolerance to accelerations of greater than 1 sec. duration is summarized for the orthogonal X, Y, & Z axes. Because each investigator at each laboratory utilizes different restraint systems, body positions, ambient temperatures, etc., and most important, utilizes different criteria of "tolerance", the data are referenced and presented in tables and graphs for each major category (direction) of acceleration. The points presented in the graphs and tables are usually the highest values achieved; in each series there were Ss who could not tolerate the given direction, amplitude, and duration.

R 26

26,077

Higgins, L.S., Enfield, S.A. & Marshall, R.J. STUDIES ON VERTEBRAL INJURIES SUSTAINED DURING AIRCREW EJECTION. FINAL REPORT. Contract NONR 4675 (00), Reg. NR 102 645/6 30 64, Rep. T1 65 041, May 1965, 150pp. USN Biological Sciences Div., ONR, Washington, D.C. (Technology Incorporated, Dayton, Ohio). (AD 615442)

Available world literature on ejection-related vertebral injuries in aviators was thoroughly surveyed and is presented as an annotated bibliography in an appendix. Basic findings of some of the principal investigators into vertebral injury are summarized. Parameters associated with the pilot, aircraft, and ejection-seat system are evaluated in the light of their trends and relative significance in contributing to ejection-caused vertebral injury. These studies led to the development of a proposed research design to determine the dynamic strength of isolated vertebrae. Preliminary research objectives are outlined. The experimental procedure and analysis techniques are set forth. A plan for sequencing and integrating the research operations is diagramed.

R 273

26,078

Hall, T.J., Passey, G.E. & Meighan, T.W. PERFORMANCE OF VIGILANCE AND MONITORING TASKS AS A FUNCTION OF WORKLOAD. Contract AF 33(657) 10506, Task 171002, AMRL TR 65 22, March 1965, 19pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.). (AD 615921)

This study was conducted to obtain control data on the performance of 3 passive tasks--auditory vigilance, warning lights monitoring, and probability monitoring--performed previously in conjunction with 3 active tasks. Ss were tested for 4 hours on each of 6 successive days. A task schedule requiring performance of all 6 tasks was employed on 2 hours of each daily session, while performance on the passive tasks alone was carried out during the remaining 2 hours. Performance on auditory vigilance, green warning lights, and probability monitoring was found to be superior when these passive tasks were performed alone. No difference in performance was found for red warning lights.

R 1

26,079

Hutchins, C.W., Jr. & Pomeroli, R.S. PERFORMANCE IN THE PRE-FLIGHT WATER SURVIVAL COURSE AS A PREDICTOR OF SUCCESS IN FLIGHT TRAINING. Spec. Rep. 65 3, June 1965, 8pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (AD 619302)

The purpose of this study was to investigate various performance measures from the Pre-Flight water survival course for their utility as predictors of eventual completion or failure in the flight training program. 2 of the variables investigated, Mid-Course Grade and Swim Hold, were found to make small but statistically significant contributions to the validity of the multiple predictor. Results suggest that the value of the water survival course as a predictor derives more from a student's initial ability as a swimmer than from his progress in the course. An interesting side discovery was the fact that a larger percentage of cadets than of AOCs fall into a Swim-Hold status, perhaps reflecting an emphasis in some college curricula on life saving and water safety courses. The water survival course grading system has been changed since this study was initiated, and it is recommended that further research be carried out to determine if this change in grading affects the contribution of the course to prediction of success in the program. The increased validity obtained by using the Swim Hold as a predictor of flight failure suggests the desirability of investigating hold-overs in other areas of the Pre-Flight program, such as physical training, academics, etc.

R 1

26,080

Galloway, W.J., Peltrassanta, A.C. & Pearsons, K.S. STUDY OF THE EFFECT OF DEPARTURE PROCEDURES ON THE NOISE PRODUCED BY JET TRANSPORT AIRCRAFT. TECHNICAL REPORT. Contract FA64WA 4949, FAA ADS 41, March 1965, 81pp. US Aircraft Development Service, FAA, Washington, D.C. (Bolt Beranek & Newman Inc., Van Nuys, Calif.). (AD 617766)

The effect of various departure procedures of commercial jet transport aircraft on the noise produced on the ground under the departure path are presented in this report. Noise data at 4 measurement stations under the flight path of Runway 13R at John F. Kennedy International Airport, New York, were obtained from 300 aircraft departures. 4 different classes of departure procedures, including those specified by current airline operating practices, are compared with the noise produced by a random set of aircraft operations where the departure procedure was unspecified. Detailed radar observations of the aircraft flights, operational information reported by pilots flying specified procedures, and the measured noise data on all flights observed were used in evaluating the various departure procedures. The study shows that implementation of a proposed departure procedure could reduce the noise levels on the ground under jet transport takeoffs by as much as 8 PNdB as compared to the noise produced by existing procedures.

26,081

Gabriel, R.F., Burrows, A.A. & Abbott, P.E. USING A GENERALIZED CONTACT FLIGHT SIMULATOR TO IMPROVE VISUAL TIME-SHARING. FINAL REPORT JUNE 1963-DECEMBER 1964. Contract N61339 1428, Proj. 7670 1, Tech. Rep. NAVTRADEVEN 1428 1, April 1965, 73pp. USN Training Device Center, Port Washington, N.Y. (Aircraft Div., Douglas Aircraft Company, Long Beach, Calif.). (AD 619047)

30 Marine A-4 pilots were given 8 carefully designed time-sharing training sessions in a simple, generalized visual flight simulator and then compared with a control group on performance in the highly specific A4 operational flight trainer equipped with a visual display. Results indicated improved ability to detect simulated mid-air collision hazards without compromising performance in the other flight tasks. Such training, therefore, is recommended as an aid in reducing the mid-air collision hazard.

R 18

26,082

Garinther, G.R. & Kryter, K.D. AUDITORY AND ACOUSTICAL EVALUATION OF SEVERAL SHOULDER-RIFLES. AMCMS Code 5011. 11.841, Tech. Memo. 1 65, Jan. 1965, 59pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 615934)

The threshold of audibility of each ear of 178 soldiers was measured before and after firing various types of shoulder rifles at the rate of 1 trigger pull every 5 sec. The acoustical impulses from each type of weapon were evaluated (peak pressure, time history, and spectrum). The peak pressures of the acoustic impulses from firing the weapons were highly correlated with threshold shifts caused by exposure to the gun noise. From these and related data, estimates are made of the expected permanent hearing level in the frequency region from 1000 cps to 6000 cps to be equalled or exceeded in 50, 25, & 10% of ears repeatedly exposed to gun noise at various peak sound-pressure levels.

R 6

26,083

Gurfinkel' V.S. BIOELECTRIC CONTROL IN MEDICINE. FTD TT 64 1019/1+2, April 1965, 8pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Vestnik Akademii Meditsinskikh Nauk SSR, (Russian), 2, 1964, pp. 33-38).

The purpose of this report is to discuss the present state of development of medicinal instrumentation with bioelectric control. General aspects of such devices are discussed with emphasis upon the following point: in bioelectric control systems biopotentials can be used, generated by most of the variegated tissues and organs, but the creation of special instruments is sensible only when the physiological importance of the corresponding bioelectric potentials is sufficiently investigated, and their derivation is simple and accessible. Specific instruments are then discussed.

R some

26,084

Varley, R.B. & Maatman, G.L. SHELTER FIRE VULNERABILITY. SURVEY AND ANALYSIS OF REPRESENTATIVE BUILDINGS. FINAL REPORT. Contract OCD OS 62 210, IITRI Proj. N6005, OCD Work Unit 2522A, March 1965, 101pp. IIT Research Institute, Chicago, Ill.

This report provides a detailed fire protection engineering analysis of the fire vulnerability of a selected national sample of stocked fallout shelters. While the findings are not necessarily representative of magnitude, they are representative of the nature of the fire vulnerability of fallout shelters. Acceptability criteria for fire-safe fallout shelters; upgrading measures, including fire extinguisher needs; and fallout shelter building code criteria are proposed.

R 15

26,085

Voskrenskiy, A.D., Gazenko, O.G. & Maksimov, D.G. (Eds.). SECOND GROUP SPACE FLIGHT, AND CERTAIN RESULTS OF FLIGHTS OF SOVIET COSMONAUTS ON THE "VOSTOK" SHIPS. FTD MT 65 256, Aug. 1965, 188pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Izdatel'stvo "Nauka", 1965, 1-228). (AD 619384)

This book presents and discusses data pertaining to the second group flight and certain results from earlier ("Vostok") flights. Topics include: general flight conditions and flight assignment; physiological-hygienic appraisal of life support systems; preflight preparations and investigations with the cosmonauts--centrifuge studies, vestibular training, thermochamber studies, isolation studies, physiological studies; flight results--prelaunch, launch, orbital--work capacity, cardiovascular state, external breathing, brain bioelectric activity, skin-galvanic reactions, etc.--descent and landing data; and postflight medical data. (HEIAS)

R 69

26,086

Franklin, M.E. & Whittenburg, J.A. RESEARCH ON VISUAL TARGET DETECTION. PART I. DEVELOPMENT OF AN AIR-TO-GROUND DETECTION/IDENTIFICATION MODEL. Contract DA 31 124 ARO D 287, DA Proj. IR120300035, HSR RR 65/4 Dt, June 1965, 155pp. USA Human Engineering Labs., Aberdeen Proving Ground, Aberdeen, Md. (Human Sciences Research, Inc., McLean, Va.). (AD 619275)

The objective of the present study was to develop a simple, operational model for predicting air-to-ground visual detection/identification of tactical targets. The model, based on data from the literature, was limited to conditions of daylight and clear visibility. A review of studies on target detection was made and major trends in the findings on a number of variables are presented in this report. A preliminary model was developed using data from a field study of air-to-ground detection/identification of tactical targets. Variables to be included in the model were selected from a list of variables found to be important in previous studies. The model includes estimates of 8 input variables--target size, target shape, target/ground contrast, clutter, terrain type, aircraft altitude, aircraft speed, and range--which were grouped into 3 composite variables (target apparent size, target distinctiveness, and effective exposure time). Because the preliminary model was based on data which were not collected for the purpose of model development, additional field studies must be conducted to develop and validate a refined model. The research necessary to validate and extend the model is described in the final section of the report. A numerical summary of relevant studies on target detection/identification and a description of model calculations are presented in a separately bound set of appendices.

R 48

26,087

Ekman, Gosta, Frankenhaeuser, Marianne, Levander, Sonja & Mellis, Inga. THE INFLUENCE OF INTENSITY AND DURATION OF ELECTRICAL STIMULATION ON SUBJECTIVE VARIABLES. Contract AF EOAR 64 29, Number 179, Jan. 1965, 8pp. Psychological Labs., University of Stockholm, Sweden. (AD 618081)

The unpleasantness and subjective duration of an a.c. current of 50 c/sec applied to 2 fingers was scaled by Ss using the method of magnitude estimation. Stimulation was varied with regard to both intensity, ranging between 1.5 & 3.5 times the individual sensation threshold, and duration, ranging from 0.18 to 1.72 sec. It was found: a) that unpleasantness increased approximately logarithmically with stimulus duration; b) that unpleasantness was a power function, with the exponent 1.5, of stimulus intensity measured with the sensation threshold as zero point; c) that subjective duration was essentially linearly related to stimulus duration; and d) that subjective duration increased approximately logarithmically with intensity of stimulation.

R 14

26,088

Ebbers, R.W. AN INVESTIGATION OF VISION DURING INVOLUNTARY SACCADIC EYE MOVEMENTS. (M.S. Thesis presented to Faculty, Graduate School, Indiana University, Bloomington Ind.). Contract AF33 608 10, June 1965, 35pp. Indiana University, Bloomington, Ind. (AD 617409)

The 1st purpose of this study, to determine the presence or absence of vision during involuntary saccadic eye movements, has been resolved. It has been shown that vision is present during the involuntary saccade. It has been further shown that while vision is present it is dependent, at least in part, upon intensity of the stimulus. The results indicate quite consistent, and large magnitude, intensity threshold differences between S & O. These differences were further reflected by an impairment of suprathreshold vision during the involuntary saccade, shown by blip-counting experiments and by measurements of visual acuity. This impairment was shown to be at least in part related to the optical smear of the retinal image, the greater the speed of movement of the retinal image, the greater was the visual impairment found in the blip-counting experiments. Since movement of the retinal image reduces the stimulus duration for a given retinal receptor, the effect is equivalent to a reduction in stimulus intensity.

R 32

26,089

Drobny, N.L. SURVEY OF ANTARCTIC WATER SUPPLY AND WASTE DISPOSAL FACILITIES, PRACTICES, AND PROBLEMS. Proj. Y F015 11 01 105, Tech. Note N 708, April 1965, 33pp. USN Civil Engineering Lab., Port Hueneme, Calif. (AD 617533)

Low temperature conditions initiate physical, biological, and chemical changes in the environment. These, in turn, pose significant problems in the design, construction, and operation of facilities for the distribution of water and for the collection, treatment, and disposal of waste. In addition, remoteness is a sizeable problem in the South Polar Region. Distance greatly slows the rate at which material can be supplied for the purposes of construction, maintenance, and repair. As a result, logistics problems assume unusually significant proportions. The need for simple systems is paramount. A survey of water supply and waste disposal problems at existing United States stations in the Antarctic is presented. Problem areas are identified, and potential research and development efforts are suggested.

R 4

26,090

Dugas, Doris J. THE PROBABILITY OF VISUAL DETECTION OF RECONNAISSANCE AIRCRAFT BY GROUND OBSERVERS. Contract AF 49(638) 700, RM 4562 PR, June 1965, 68pp. Rand Corporation, Santa Monica, Calif. (AD 619033)

An investigation of the ability of ground Os, unaided by optical or electronic devices, to detect visually each of 6 reconnaissance aircraft was made. Calculations are made for a variety of conditions, in altitudes, speeds, and visibilities. Among several conclusions are: a) the probability of visual detection falls off rapidly as aircraft altitude is decreased below 2000 ft; b) increasing speed is an effective way to reduce detectability; c) contrast is a critical factor in determining detectability but is difficult to predict or control.

R 12

26,091

Collins, W.E. ADAPTATION TO VESTIBULAR DISORIENTATION: I. VERTIGO AND NYSTAGMUS FOLLOWING REPEATED CLINICAL STIMULATION. AM 65 18, May 1965, 15pp. US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla. (AD 617091)

40 unilateral caloric irrigations were administered in a habituation series to each of 2 groups of Ss. 1 group was tested in total darkness. Ss in the 2nd group were stimulated in illumination and actively attempted to control and suppress their eye movements by means of visual fixation. Pre- and posttests were administered (always in total darkness) in which both directions of response were elicited. In all cases, tasks were assigned to Ss to maintain alertness. The nystagmic reaction was altered as a result of the habituation series, but the change was different for the 2 groups. After 1 month of rest, there was no apparent recovery of the response toward the pretest level for either group. Subjective reactions declined in intensity for both groups, but showed recovery after a 1-month rest period.

R 13

26,092

Chambers, J.V. SOME ENVIRONMENTAL ASPECTS OF THE HUMAN FACTORS TROPICAL FIELD STUDIES. Proj. IV025001A29, Tech. Rep. ES 16, May 1965, 25pp. USA Natick Labs., Earth Sciences Div., Natick, Mass. (AD 617706)

The purpose of this study was to determine which environmental factors influence the performance (especially mobility rate) of the Quartermaster-equipped soldier in the tropics. The method was for an environmental O to accompany troops on 3 types of operational exercises (reconnaissance and combat patrols and raid exercises) during both wet and dry seasons at Fort Sherman, Canal Zone. Data were recorded showing: weather, movement terrain, surface conditions and vegetation at regular intervals. Tables are presented summarizing climatic conditions, terrain and mobility rates. Maps and route profiles show vegetation types and surface geology. The results of the reconnaissance and combat patrols are not such that they could be generalized on or explained by the environment. However, in the raid operations significant differences were found between the data for the 2 seasons. The slower mobility rate of the wet season is attributed to: a) the prevalence of mud (the greatest hindrance to movement); b) the debilitating effects of high humidity (the most significant environmental factor affecting comfort); and c) a lower visibility than in the dry season. Other factors, significant in both seasons are: frequency of obstacles (streams, gullies and deadfalls), and dense stands of vegetation.

R 10

26,093

Chaillet, R.F. HUMAN FACTORS ENGINEERING REQUIREMENTS FOR THE DEVELOPMENT OF U.S. ARMY MATERIAL. HEL Standard S 4 65, Jan. 1965, 13pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 617559)

This standard (HEL Standard S-4-65) establishes the requirements for applying the principles and procedures of human factors engineering to the research, development, test and evaluation (RDT&E) of military systems and their related materiel. These requirements include: a) the scope and nature of work to be accomplished by the contractor HFE personnel in effecting an integrated HFE effort; b) the information to be furnished by the contractor to provide the procuring activity with positive management control of the HFE effort; c) information which will permit procuring activity to assess adequately the contractor's ability to perform HFE. The objectives of an HFE program is to assure that the principles, procedures and criteria of HFE are applied during all phases of system RDT&E. This objective will require the integration and application of HFE to equipment and facilities design, operational and maintenance requirements, task and skill requirements, training, training devices and job aids. The purpose of this standard is twofold: a) to define the human factors engineering requirements applicable when contractors respond to AMC Requests for Proposals; b) to define the human factors engineering requirements applicable during system research, development, test and evaluation. Major shortcomings frequently noted in proposals submitted for consideration include insufficient explanation of such control techniques as: a) scheduling of the HFE program; b) maintenance of HFE records and data; c) participation by HFE in systems analysis and trade-off studies.

26,094

Creswick, J. & Rogers, E. A COMPARISON OF SYNTHETIC AND COTTON PROTECTIVE CLOTHING. C.I. Memo. 170, April 1965, 20pp. Chemical Inspectorate, Hqs. Bldg., Royal Arsenal, London, England. (AD 467493)

A practical trial is described designed to compare the life and suitability of synthetic fibre fabrics against the cotton drill clothing normally worn in our chemical laboratories. The synthetic fibre coats are relatively expensive but because they outlast under normal wear 2, 3, or 4 cotton coats and have better draping qualities and smarter appearance they could be preferable in the long run. An estimate of the cost of the synthetic fibre fabric is approximately 2 1/2 times that of the cotton one, the "make-up" price being the same.

26,095

Cohen, A.M. THE ORGANIZATIONAL BEHAVIORS AND ADAPTATIONS TO ORGANIZATIONAL CHANGE OF SENSITIZER AND REPRESSOR PROBLEM-SOLVING GROUPS. 1965, 41pp. Emory University, Atlanta, Ga. (AD 619212)

Twelve repressor and twelve sensitizer groups went through the following experimental sequence: fifteen trials in a Wheel network, working on Common Symbol problems (simple task); fifteen trials in a Completely-connected network working on Story Completion problems (complex task). The results revealed that the kinds of problem-solving systems that groups developed before and after organizational and task changes were not significantly influenced by differences in sensitization-repression. However, repressors developed appropriate problem-solving systems before and after network and task changes somewhat earlier, utilized their systems more efficiently (solved problems more quickly) and exhibited significantly greater leadership continuity. Differences between repressor and sensitizer groups in times taken to solve problems were most significant at the beginning of the experiment, less significant (although still statistically significant) following change in communication network and not significant following change to a more complex task. It was concluded from this experiment that the ability of a group to solve problems and adapt to change rests on both its capacity (largely influenced by the personalities of its members) to withstand threats to and disturbances of its equilibrium (particularly under conditions of high uncertainty and novelty characterizing the early phases of group life and initial introduction to a new or changed environment) and by its ability to cognize correctly (influenced primarily by situational and intellectual factors) about the problems facing it and how to organize in order to deal with such problems.

R 21

26,096

Clark, H.J. TRAJECTORY VERSUS LINE-OF-SIGHT SPACE RENDEZVOUS USING OUT-OF-WINDOW VISUAL CUES. Proj. 7184, Task 718401, AMRL TR 65 10, Feb. 1965, 53pp. USAF Behavioral Sciences Labs., Wright-Patterson AFB, Ohio. (AD 615157)

7 trained Ss flew simulated short range coplanar orbital rendezvous maneuvers, using direct visual cues only. 2 rendezvous techniques were compared: line-of-sight and trajectory. In the former, the Ss could control up-down and fore-aft thrust only; in the latter, he could, in addition, control pitch. Using either technique, all Ss were able to maneuver successfully to a position 100 ft directly in front of the target at a terminal velocity of less than 5 ft/sec. Significantly, less fuel was expended in performing the trajectory maneuver. The principal man-machine performance factors in the line-of-sight maneuver were tentatively described as: a) the ability to conserve fuel used for longitudinal and vertical translation; b) the ability to conserve mission time; and c) the ability to proficiently close with the target. The principal factors for the trajectory maneuver were tentatively described as: a) the ability to conserve fuel for longitudinal translation; b) the ability to conserve mission time; c) the ability to effectively apply longitudinal thrusts and conserve fuel used for vertical translation; and d) the ability to match the trajectory path of a minimum fuel 2 impulse maneuver. Computer diagrams fully describing the analog simulation are included in the report.

R 7

26,097

Bauer, R.W. & Blackmer, R.F. AUDITORY LOCALIZATION OF NOISES. AMCMS Code 5011.11.841, Tech. Memo. 4 65, Jan. 1965, 21pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 618374)

This report summarizes 3 studies of unaided auditory localization of fixed noise sources. Pointing was as accurate as aiming at auditory targets in darkness. Elevation errors were not significantly larger than azimuth errors. Ss with hearing deviations (defects) performed as well as non-deviant Ss (normals) in auditory localization.

R 4

26,098

Bishop, D.E. NOISE CONTOURS FOR SHORT AND MEDIUM RANGE TRANSPORT AIRCRAFT AND BUSINESS AIRCRAFT. TECHNICAL REPORT. Contract FA64WA 4949, FAA ADS 35, March 1965, 40pp. US Aircraft Development Service, FAA, Washington, D.C. (Bolt Beranek & Newman Inc., Van Nuys, Calif.). (AD 617763)

Generalized noise contours, in terms of the perceived noise level, are presented for take-off and landing operations of: a) 2 & 3 engine, short and medium range turbojet and turbofan transport aircraft, (Boeing 727, BAC 1-11, Douglas DC-9 and Sud Aviation Caravelle 3 & 6); b) multi-engine turbojet and turbofan business aircraft (Jet Commander 1121, Dassault Falcon, Hawker Siddeley D.H. 125, Lear Jet 23, Lockheed JetStar and North American Sabreliner); and c) 2-engine propeller transport and business aircraft. Estimates of ground runup noise for aircraft in groups a) & b) above are also presented. The noise contours are based on noise measurements and estimates. The noise contours extend the scope of aircraft noise information for land use planning in the vicinity of airports. The noise information should be particularly helpful in describing the noise environment in and about smaller airports not regularly handling military or large civil jet transport aircraft.

R 4

26,099

Bishop, D.E. HELICOPTER NOISE CHARACTERISTICS FOR HELIPORT PLANNING. TECHNICAL REPORT. Contract FA64WA 4949, FAA ADS 40, March 1965, 61pp. US Aircraft Development Service, FAA, Washington, D.C. (Bolt Beranek & Newman Inc., Van Nuys, Calif.). (AD 617764)

Noise data and simplified procedures are presented for estimating the perceived noise levels produced by current civil and military helicopters (piston- and turbine-powered) during takeoff, landing, flyover and hover operations. Noise data and procedures are also presented for comparing helicopter noise with other vehicle noise and with ambient noise found in typical urban and suburban areas. The procedures permit an assessment of the compatibility of helicopter noise with typical land uses near heliports. Generalized helicopter noise data are presented in the form of noise contours and in perceived noise level-vs-distance charts for different helicopter categories. The generalized noise charts are based upon measurements of a number of military and civil aircraft. Analysis of these measurements shows that: a) for most helicopters the spread in perceived noise levels for takeoff, landing, flyover and hover operations is of the order of 5 PNdB or less, a spread in noise levels much less than encountered for fixed-wing aircraft; b) piston-powered helicopters are noisier than turbine-powered helicopters of comparable size. No consistent difference in noise levels between single and dual rotor helicopters was noted; c) perceived noise levels for turbine-powered helicopters show greater changes with size of aircraft than do noise levels for piston-powered helicopters; d) for planning purposes, noise radiation from helicopters can be assumed to be non-directional in both vertical and horizontal planes.

R 16

26,100

Berner, C.A. TV MOSIAC DISPLAY GENERATOR GROUP. FINAL REPORT. Contract FA WA 4671, Proj. 104 126D, Rep. RD 65 51, June 1965, 69pp. US Systems Research & Development Service, FAA, Washington, D.C. (Raytheon Company, Wayland, Mass.). (AD 619160)

A developmental television mosaic display generator for the National Airspace System is described. The optimum coverage portions of 8 air traffic control radars are combined into a composite picture covering a large surveillance area. 10 air traffic controllers may view any portion of the mosaic area with a movable display "window." Input data to the system is radar video which has been scan-converted from PPI to 945-line television. Grey level photographic slides are used with television cameras in a video blanking generator to select scan-converted radar video for inclusion in the mosaic. Timing for the system is generated by a digital master synchronizer which is fully compatible with existing RBDE-5 equipment. Improved air traffic control methods are developed using the TV mosaic to advance the safe and efficient movement of air vehicles in the Nation's airspace.

26,101  
Bolt Beranek & Newman, Incorporated. DEVELOPMENT OF TECHNIQUES FOR THE AUTOMATIC CONTROL OF EXPERIMENTS IN A PSYCHOLOGY LABORATORY. FINAL REPORT. Contract AF 19 (628) 296, Proj. 4690, Task 469002, ESD TDR 65 175, BBN 121, Feb. 1965, 145pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Bolt Beranek & Newman, Inc., Cambridge, Mass.). (AD 614793)

This report details the development of methods for using a digital computer (the Digital Equipment Corporation PDP-1) to control apparatus and experimental procedures in psychological experiments. It describes the design of equipment for a multi-subject display system and a psychoacoustic laboratory system. An experiment illustrating the use of the system is included.

R 5

26,102  
Arias, R.F.A. AURAL RECEPTION OF INSTRUMENT LANDING SYSTEM SIGNALS. (M.S. Thesis presented to Faculty, Graduate School, University of North Dakota, Grand Forks, N.D.). Contract AF 33 608 1093, March 1965, 19pp. University of North Dakota, Grand Forks, N.D. (AD 617414)

There is an apparent need for more aids to land aircraft under precision instrument control in adverse weather. 1 existing system is the Instrument Landing System (ILS) which uses special transmitted ground radio signals from directional antennas and a compatible radio receiver in the aircraft. The ILS receiver is coupled to a meter on the instrument panel which gives the pilot a visual reference of his position relative to the glide path and center-line of the runway. This thesis demonstrates a way by which the ILS can in addition be made to electronically supply an audible signal to assist the pilot in his approach to a landing. The outputs from the ILS receiver are voltages whose levels are proportionate to the angular distances from the center-line of the runway and the glide path. These output voltages supply the threshold triggers for a series of Schmitt Triggers. By coupling the Schmitt Triggers into a network of sequentially triggered monostable multivibrators, a pair of signal generators can be made to produce audible signals that identify the aircraft's position. In effect, this system is an intermediary between the Ground Control Approach (GCA) voice system and the ILS.

R 3

26,103  
Gruber, A., Dunlap, J.W., DeNittis, G., Sanders, J.L., et al. DEVELOPMENT OF A METHODOLOGY FOR MEASURING INFANTRY PERFORMANCE IN MANEUVERABILITY. THIRD PARTIAL REPORT. Contract DA 19 129 QM 2068 (OI 6141), TECOM Proj. 8 3 7700 01, Phase II, June 1965, 74pp. USA Test & Evaluation Command, Fort Lee, Va. (Dunlap & Associates, Inc., Darien, Conn.). (AD 467157)

A three-phase research effort is underway to develop field methodology for measuring the effects of experimental clothing and equipment on the combat effectiveness of individual infantrymen. One of the tasks considered by a sample of combat veterans to be important to combat success was the ability to move and maneuver while under observation or fire. This report describes the work performed to develop a reliable method for measuring soldier performance in the essential ingredients of this task under conditions considered representative of combat conditions. A proposed test course was established as a temporary facility and tested for reliability and sensitivity to differences in clothing and equipment using USAGETA Troops. It was determined that the events comprising the tested course provided a practical and useful basis for measuring the maneuverability of individual soldiers. A modified data collection system is recommended for an integrated field course to be evaluated as the next step in the research program.

26,104  
Gruber, A., DeNittis, G., Dunlap, J.W., Sanders, J.L., et al. DEVELOPMENT OF METHODOLOGY FOR MEASURING INFANTRY PERFORMANCE IN GRENADE THROWING. FIFTH PARTIAL REPORT. Contract DA 19 129 QM 2068 (OI 6141), TECOM Proj. 8 3 7700 01, Phase II, June 1965, 49pp. USA Test & Evaluation Command, Fort Lee, Va. (Dunlap & Associates, Inc., Darien, Conn.). (AD 467158)

A 3-phase research effort is underway to develop field methodology for measuring the effects of experimental clothing and equipment on the combat effectiveness of individual infantrymen. One of the tasks which were considered by a sample of combat veterans to be important to combat success was the ability to throw hand grenades accurately in various battle situations. This report describes the work performed to develop a reliable method for measuring soldier performance in throwing grenades at both horizontal and vertical targets. A proposed test course was established as a temporary facility and tested for reliability and sensitivity to differences in clothing and equipment using USAGETA Troops. It was determined that the tested course provided a practical and useful basis for measuring performance in the task and a modified data collection system was recommended for inclusion in an integrated course to be evaluated as the next step in the research program.

26,105  
Gruber, A., Dunlap, J.W., DeNittis, G., Sanders, J.L., et al. DEVELOPMENT OF A METHODOLOGY FOR MEASURING INFANTRY PERFORMANCE IN DIGGING HASTY FIGHTING POSITIONS. SIXTH PARTIAL REPORT. Contract DA 19 129 QM 2068 (OI 6141), TECOM Proj. 8 3 7700 01, Phase II, June 1965, 60pp. USA Test & Evaluation Command, Fort Lee, Va. (Dunlap & Associates, Inc., Darien, Conn.). (AD 467159)

A 3-phase research effort is underway to develop field methodology for measuring the effects of experimental clothing and equipment on the combat effectiveness of individual infantrymen. This report covers a portion of the work performed under Contract DA 19-129-QM-2068 (OI 6141) by Dunlap and Associates, Inc., and is the 6th of a series of 7 reports presenting the results of Phase II of the study. The 1st partial report in this series reported work performed to identify and rank the relative importance of the physical tasks performed in combat by the individual infantryman. 1 of the tasks which was considered by a sample of combat veterans to be important to combat success was the ability to construct an individual fighting position rapidly in a combat area. This report describes the work performed at Fort Lee, Virginia, to develop a reliable method for measuring soldier performance in this task. Procedures were established for measuring performance in the excavation of a simulated fox-hole and tested for reliability and sensitivity to differences in clothing and equipment using USAGETA Troops. 4 possible test methods were evaluated and a modified test situation with an automatic data collection system is recommended for inclusion in an integrated field course to be evaluated as the next step in the research program. The method selected involves the prestressing of participants with 3 100-yard dashes after which the times to excavate specified weights of earth are recorded.

26,106

Siegel, A.I., & Wolf, J.J. DIGITAL SIMULATION OF SUBMARINE CREW PERFORMANCE. II. COMPUTER IMPLEMENTATION AND INITIAL RESULTS OF THE APPLICATION OF A PSYCHOSOCIAL "MODEL" FOR DIGITALLY SIMULATING CREW PERFORMANCE. FINAL REPORT. Contract Nonr 4021(00)(FBM), Aug. 1965, 105pp. USN Group Psychology Branch, ONR, Washington, D.C. (Applied Psychological Services, Wayne, Penn.).

This is the second Applied Psychological Services' report, in a series, concerning the development, verification, and utilization of a psychosocial digital simulation model. The model was described in the initial report (Siegel, Wolf, Barcik, & Miehle, 1964) as a technique for simulating the performance of submarine crews operating in confined quarters for extended time intervals. This report presents further developmental information on the model and sensitivity data from its initial use. Some general aspects of simulation, as they apply to the model, are developed first. Then the computer and computer programming aspects of the model are presented. A hypothetical ten day mission, generated to approximate a potentially realistic situation, is described and employed as a demonstration of the sensitivity of some of the model's critical parameters.

R 31

26,107

Graybiel, A. (Chm.). SYMPOSIUM ON THE ROLE OF THE VESTIBULAR ORGANS IN THE EXPLORATION OF SPACE. Report from: "Symposium held at U.S. Naval School of Aviation Medicine, Pensacola, Florida, January 20-22, 1965." NASA SP 77, 1965, 391pp. National Aeronautics & Space Administration, Washington, D.C.

The topic of this NASA Symposium was the role of the vestibular organs in the exploration of space. 31 papers are included. The following is a fairly representative sample of the areas discussed: a) Form and Innervation of the Vestibular Epithelia; b) The Modulating Influence of the Otolith Organs on Semicircular Canal Functions; c) A New Quantitative Ataxia Test Battery; d) The Nature of Adaptation to Oscillatory Rotation; e) The Vestibular Contribution to Stabilization of the Retinal Image; f) Space-Based Centrifuge; g) Radio-Sensitivity of the Vestibular Apparatus of the Rabbit; h) Vestibular Problems in Rotating Spacecraft; i) Observations on Subjects Exposed to Prolonged Rotation in a Space Station Simulator; j) Biochemical Responses to Vestibular Stimulation; k) Antimotion Sickness Drugs for Aerospace. (HEIAS)

26,108

Devoe, D.B. INTEGRATION OF CONCURRENT VISUAL AND AUDITORY MESSAGES. FINAL REPORT. Contract AF19(628) 4073, Proj. BPSN 6899, 7802, 7682, Task 768201, ESD TR 65 461, Rep. F 4068 I, Oct. 1965, 62pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Sylvania Electronic Systems, Sylvania Electric Products Inc., Waltham, Mass.).

2 experiments were performed involving the concurrent presentation to human Ss of 2 messages, 1 auditory and 1 visual, followed by a question requiring information from both messages. The results indicated that bimodally-presented information can be integrated for decision making. However, there was no evidence of an advantage to bimodal presentation as a means of unburdening an overloaded sense. The implications of the results for displays and communications in complex control centers are discussed and directions for future research are suggested.

R 33

26,109

Watkins, W.H. EFFECT OF INTENSITY CHANGES IN AUXILIARY STIMULI ON AUDITORY AND VISUAL SIGNAL DETECTION. Proj. 7682, Task 768201, ESD TR 66 121, Dec. 1965, 52pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

Results of automated tone detection experiments are reported. Subjects were required to identify one of four short intervals as having contained a weak, earphone-presented, auditory signal. These experiments involved approximately 20,000 trials. Each experiment employed at least two lighting conditions. In general, when the light source intensified during the intervals, detection was superior to that occurring when the light diminished at corresponding times. The findings are compared with the results of analogous experiments involving visual signal detection under several conditions of auditory stimulation (Watkins & Feehrer, 1965). Some possible explanations for consistencies in the two kinds of experiments are considered, and individual differences are discussed.

R 28

26,110

Bjorkman, M., Garvill, J., & Molander, B. CROSS-MODAL TRANSFER AS A FUNCTION OF PREPARATORY SET AND DISTINCTIVENESS OF STIMULUS ASPECTS. Number 186, March 1965, 19pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

In 4 experiments designed as paired associate learning transfer from visual presentation of stimuli to tactual presentation was investigated. The stimuli were 7 3-dimensional non-sense objects to which the numbers 1 to 7, were assigned. Transfer was studied as a function of preparatory set and distinctiveness of stimulus aspects. Set was varied by 2 forms of the instruction, 1 directive and 1 non-directive. Distinctiveness was manipulated by varying the color of the objects. 2 hypotheses were put forward: a) when the instruction is directive and thus the subject told to attend to common aspects transfer will be higher; b) cross-modal transfer is inversely related to distinctiveness of the modality-specific aspect color. Taken as a total the 4 experiments give quite conclusive evidence, showing that cross-modal transfer can be manipulated in a predictable manner by variations in set and distinctiveness. When the subjects are set to attend to common aspects, transfer increases, and transfer decreases when the distinctiveness in a modality-specific aspect is increased. It was also found that a directive instruction can to a considerable degree compensate for high distinctiveness in the modality-specific aspect.

R 18

26,111

Fischl, M.A. & Siegel, A.I. MULTIDIMENSIONAL SCALING ANALYSIS AND ITS APPLICATIONS FOR THE CIVIL DEFENSE ORGANIZATION. Contract OCD PS 64 30, OCD Work Unit 4421C, Sept. 1965, 48pp. US Office of Civil Defense, DA, Washington, D.C. (Applied Psychological Services, Wayne, Penn.).

This report describes the principles and procedures associated with multidimensional scaling analysis, and related multidimensional scaling analysis to the concept of a personnel subsystem within the Civil Defense organization. Four areas of application of the technique are presented; the authors conclude that the technique is of broad relevance to system planning and is feasible for application to the Civil Defense personnel subsystem.

R 6

26,112

Siegel, A.I. & Pfeiffer, M.G. POST-TRAINING PERFORMANCE CRITERION DEVELOPMENT AND APPLICATION. PERSONNEL PSYCHOPHYSICS--FACTOR ANALYSIS OF CATEGORY AND MAGNITUDE SCALES OF ELECTRONIC CIRCUIT COMPLEXITY. TECHNICAL REP. RT. Contract Nonr 2279(00), May 1965, 42pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Applied Psychological Services, Wayne, Penn.).

Journeymen electronics maintenance personnel judged the complexity of 16 avionics circuits using 4 different psychological scaling procedures on 2 separate occasions. The scale values representing these 8 variables were intercorrelated; the resulting coefficients were factor analyzed separately for each of the 16 circuit stimuli to test the hypothesis that 2 factors would account for the data. After considering 1, 2, 3, & 4 factor solutions, a 2 factor solution was chosen. These 2 factors suggested the taxonomy of "cognitive discrimination" and "contextual uncertainty" to account for the Ss' scaling behavior. Most frequently, the paired comparison and the constant sum methods were loaded heaviest on factor 1, "cognitive discrimination." The rank order and the magnitude estimation methods were most consistently loaded heaviest on "contextual uncertainty," factor 2. The findings are interpreted in their relationship to certain customary psychological scaling classificatory schemes.

R 26

26,113

Coules, J. & Avery, D.L. HUMAN DIFFERENTIAL SENSITIVITY TO VIBROTACTILE STIMULATION USING A PASSIVE ENVIRONMENTAL SENSOR. Proj. 7682, Task 768201, ESD TR 65 576, Nov. 1965, 27pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

A passive environmental sensor was evaluated as an input device capable of presenting tactile data to a human. The experiment provided information on the ability of the human to detect differences within the range of the vibratory transducer. Frequency discrimination thresholds showed wide differences between Ss and a significant increase in human sensitivity at 1 point of the frequency input levels. This increased sensitivity was explained in terms of the resonant frequency of the vibrator and also in terms of the generally known high human sensitivity for amplitude and frequency changes at 200-300 cps. It was concluded that for fine-grain data discrimination individual differences may influence the final design of the sensor. However, these differences may be reduced and the sensitivity of the user improved if its electronic design and its transducers provide redundancy to the human.

R 8

26,114

Dowd, P.J. FACTORS AFFECTING THE QUALITY OF THE ELECTRONYSTAGMOGRAMS IN VESTIBULAR STIMULATION. Task 775003, SAM TR 65 68, Sept. 1965, 6pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

Electronystagmographic (ENG) recordings of vertical vestibular nystagmus induced by Coriolis stimulation are influenced by certain factors. 4 factors studied were: eyes open in a state of reverie; eyes open in a state of alertness, the subject mentally working arithmetic problems; eyes closed in a state of reverie; eyes closed in a state of alertness, the subject mentally working arithmetic problems. 45 nonflying airmen were observed. The occurrence of motion sickness during the experiment disqualified 13 Ss; 32 completed all experimental conditions. All the Ss were subjected to all 4 conditions, the order being randomly assigned. A counterbalancing of conditions was employed with 8 Ss assigned to each of the 4 orders of the 4 conditions presented. The factors investigated influence the decay function and the sensitivity of nystagmic responses to Coriolis stimulation. For this reason when presenting nystagmic recordings as a result of rotation, it is important to indicate the conditions and the environment to which a subject is exposed during the recordings.

R 25

26,115

Meyers, J., Calonge, M.A., Parrino, P.S. & Snyder, Martha W. HEAT SYNDROME DATA FROM SELECTED HOSPITAL RECORD SURVEY. FINAL REPORT. Contract OCD 08 62 100, Subtask 1221A, Dec. 1965, 82pp. US Department of Health, Education & Welfare, Washington, D.C. (AD 623578)

This is a statistical analysis of heat syndrome causes, both environmental and human factors, with preventive and alleviating suggestions for civil defense shelters and similar situations. It should provide useful base for clinical evaluation, for physicians and other medical personnel in emergency situations.

26,116

Lloyd, A.J. & Caldwell, L.S. ACCURACY OF ACTIVE AND PASSIVE POSITIONING OF THE LEG ON THE BASIS OF KINESTHETIC CUES. J. comp. physiol. Psychol., 1965, 60(1), 102-106. (University of Kentucky, Lexington, Ky. & USA Medical Research Lab., Fort Knox, Ky.). (Reprint)

40 men were studied to determine the accuracy of active and passive positioning of the legs to specified angular positions. Accuracy of positioning was significantly influenced by the mode of movement and by goal positions. The range of greatest accuracy for active movement coincided with the normal walking arc of the lower leg. Thus accuracy of positioning may be best for the condition and in the range of movements in which there has been greater prior practice, or possibly the distribution and rate of firing of the receptors may favor discrimination in this range. These data suggest that the joint receptors not only provide information, but also are a source of potential noise in the afferent system.

R 8

26,117

Bliss, J.C. & Crane, H.D. EXPERIMENTS IN TACTUAL PERCEPTION. Contract NAS 2 1679, NASA CR 322, Nov. 1965, 197pp. National Aeronautics & Space Administration, Washington, D.C. (Stanford Research Institute, Menlo Park, Calif.).

This report describes basic studies on tactile perception and communication. There are 5 main sections (II to VI) describing different psychological experiments and 7 appendices describing instrumentation and equipment for these experiments. In Section II, experimental sessions are described in which words, sentences, and paragraphs were transmitted to Ss by a tactile display. Ss were able to read tactually from these displays at a rate of 20 words per min. after less than 20 hours of training, and 1 S reached 30 words per min. in 45 hours of training. Sessions in which a specially designed tactile alphabet is developed are discussed in Section III. Factors such as learnability, edge effects, letter packing, and number of fingers used are considered. In Section IV, studies of 2-dimensional compensatory tracking with a continuous visual display, a discrete visual display, and a discrete tactile display are described. A series of experiments were performed with these displays in which display gain and command signal bandwidth were varied. Performance with the tactile and discrete visual displays was found to be approximately equal. A series of phenomenological observations is described in Section V. Apparent position, apparent motion, and illusions are some of the effects commented on. Finally, in Section VI 3 series of quantitative studies are reported.

R 50



26,118  
Eisler, H. PSYCHOLOGICAL MEASUREMENT OF ACOUSTIC QUALITY OF SOUND REPRODUCING SYSTEMS BY MEANS OF FACTOR ANALYSIS. Number 188, March 1965, 11pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

4 Ss judged the quality of 24 programs played on 10 sound reproducing systems on a 7-point scale. The data were factor analyzed (component analysis of co-variances), and factor loadings for the programs and factor scores for the loudspeakers computed. 9 factors were extracted and rotated, and 7 of them tentatively interpreted. Despite technically imperfect conditions it is concluded that factor analysis is a useful instrument for the assessment of acoustical properties.

R 5

26,119  
England, R.T. & Powell, R.G. NEARFIELD INFRASONIC NOISE GENERATED BY THREE TURBOJET AIRCRAFT DURING GROUND RUNUP OPERATIONS. FINAL REPORT JUNE 1964-AUGUST 1964. Proj. 7231, Task 723104, AMRL TR 65 132, Aug. 1965, 16pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Acoustic measurements in the frequency range between 4.5 to 4500 cycles per second were made on the near field sound pressure environment produced by the F-101B, NF-102A, and F-106A turbojet aircraft during ground runup operations. Results from 28 microphone locations show that the maximum infrasonic noise below audio frequency range is generated downstream from the exhaust nozzle and at engine settings producing maximum turbulent flow.

R 5

26,120  
Mohr, G.C., Cole, J.N., Guild, Elizabeth & von Gierke, H.E. EFFECTS OF LOW FREQUENCY AND INFRASONIC NOISE ON MAN. Aerospace Med., Sept. 1965, 36(9), 817-824. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Future manned space systems, with larger payloads and more powerful boosters, will generate during launch operations noise environments with maximum energy in the 1-100 cps frequency range. In order to investigate human tolerance to such environments, 5 noise-experienced officers were exposed for 2-min. periods to high intensity broad-band, narrow-band, and pure-tone low frequency noise. The effects of these exposures on cardiac rhythm, hearing threshold, visual acuity, fine motor control, spatial orientations, speech intelligibility and subjective tolerance were observed. Exposures up to 154 dB in the 1-100 cps range were achieved; the range of human exposure to infrasound was extended from 20 to 40 dB above prior documented experience. Both objective and subjective responses of the Ss demonstrated that short-duration exposure to low frequency noise up to 150 dB is well within human tolerance limits. Exposures above 150 dB elicited responses indicating the limiting range of subjective tolerance and reliable performance was being approached.

R 7

26,121  
Traul, Gail N. & Black, J.W. THE EFFECT OF CONTEXT ON AURAL PERCEPTION OF WORDS. J. speech hear. Res., Dec. 1965, 8(4), 363-369. (Franklin County Public Schools, Franklin County, Ohio & Ohio State University, Columbus, Ohio). (Reprint)

50 words were recorded 5 times by 5 speakers. The 5 recordings represented 5 amounts and kinds of "context" (word in isolation, word said twice, word followed by a warning against making a common error, word in second-order, and word in third-order approximation to language). Listening panels heard the recordings and from their responses measures of word intelligibility and disparity, represented as information, were computed. The disparities among the responses decreased progressively from one condition to another in the order enumerated above; similarly, intelligibility increased, with the exception that no advantage resulted from saying a word twice.

R 8

26,122  
Hodge, D.C., McCommons, R.B. & Blackmer, R.F. RELIABILITY OF TEMPORARY THRESHOLD SHIFTS CAUSED BY REPEATED IMPULSE-NOISE EXPOSURES. AMCMS Code 5011.11.841, Tech. Memo. 3 65, Feb. 1965, 29pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 618324)

22 Ss were exposed to the same gunfire-noise condition 9 times. Their auditory thresholds were measured at 6 frequencies from 500 to 6000 cps before and after exposure, and all temporary threshold shifts (TTSs) were converted to TTS<sub>2</sub> for ease of comparison. Fluctuations in mean TTS<sub>2</sub> were 5 db or less for all frequencies across the 9 exposures, but individual differences were large and the reliability coefficients were small. It was concluded that, while repeated-measurement experimental designs appear appropriate for impulse-noise studies, group data are more meaningful than data for individual Ss. Very small samples of Ss should not be used for such studies, because it is important to be able to generalize the Army as a whole.

R 13

26,123  
Foulke, E. (Princ. Investigator). COMMUNICATION BY ELECTRICAL STIMULATION OF THE SKIN. FINAL PROGRESS REPORT, 1 NOVEMBER 1962-31 MARCH 1965. Grant DA 49 193 MD 2525, July 1965, 14pp. USA Medical Research & Development Command, DA, Washington, D.C. (Psychology Dept., University of Louisville, Louisville, Ky.).

Work is reported on the development of a communication system based upon electrical stimulation of the skin. Training on a code composed of signals that combined values in the 3 stimulus dimensions of locus, intensity, and duration was terminated. It was concluded that the communication rate possible with a code of this sort was seriously limited by the long, and apparently irreducible, reaction times to code signals. Another code, with patterns of simultaneously stimulated locations used as signals, was tested. Reaction times to signals of this sort were found to be much shorter, and when appropriate restrictions were placed upon the kinds of location patterns to be used in the code, high accuracy was demonstrated. This stimulus alphabet is now felt to be sufficiently developed to justify an attempt to pair its signals with the elements in the Katakana Syllabary, and to teach the resulting ensemble to Japanese Ss who are familiar with the Katakana Syllabary. Collateral studies were conducted in an effort to learn more about the parameters of the electrocutaneous stimulus. Included were an investigation of the absolute threshold of the electrocutaneous stimulus as a function of several relevant variables, the determination of equal apparent intensity contours for the electrocutaneous stimulus, absolute identifications of the intensity of an electrocutaneous stimulus at 2 levels of irrelevant information, an exploration of a technique for stimulating with an electric spark with a view to improved multiple stimulus acuity, and finally an effort to transmit Morse Code in which the usual auditory signals were replaced by electrocutaneous signals.

R 6

26,124

Black, J.W., Guberian, P., Cinquini, U., Ancona, Teresa, et al. APPLICATIONS OF A LANGUAGE PREDICTION TECHNIQUE TO SPEECH AND HEARING. Folia phoniatrica, 1965, 17, 33-42. (Ohio State University, Columbus, Ohio). (Reprint)

Groups of individuals of 3 languages were equally successful in predicting successive units of their native languages. They were also similar in their degrees of consensus in their specific responses when they predicted incorrectly. The vocabulary that they generated, as they named words that were probable in the light of the context, contained many repetitions of highly familiar words. The technique is recommended for eliciting representative diction from an individual.

R 4

26,125

Otten, K.W. AUTOMATIC SPEECH RECOGNITION. Contract AF 33(615) 2019, Proj. 4335, Task 433521, AFAL TR 65 205, Rep. 33 IF, Sept. 1965, 114pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (National Cash Register Company, Dayton, Ohio). (AD 471649)

Recognition methods which use the redundancy contained in the structural description of a language (higher-order recognition methods) are described and their performance analyzed. Analysis is performed by computer simulation using models for a simplified structured language and acoustical speech recognition operation (lower-order recognition operation). The effect of segmentation errors has been found to be the determining factor in the choice of the recognition parameters.

26,126

Nixon, C.W. & Hubbard, H.H. RESULTS OF USAF-NASA-FAA FLIGHT PROGRAM TO STUDY COMMUNITY RESPONSES TO SONIC BOOMS IN THE GREATER ST. LOUIS AREA. NASA TN D 2705, May 1965, 28pp. National Aeronautics & Space Administration, Washington, D.C. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio & NASA Langley Research Center, Langley Station, Hampton, Va.).

Data are presented from a series of community-reaction flight experiments in which the population of a large city was repeatedly exposed to sonic booms in the range of overpressures up to about 3.1 lb/sq ft. Results were obtained from direct interviews, analyses of complaint files, and engineering evaluations of alleged damage and are correlated with information on aircraft operations and sonic-boom pressure measurements. Personal-interview studies indicated that about 90% of those contacted experienced some interferences as a result of sonic booms, about 35% were annoyed by them, less than 10% had contemplated complaint action, and less than 1% had actually filed a formal complaint. The total number of complaints and subsequent claims were approximately proportional to the number of flights. Building responses are a significant factor in community response. Alleged building damage was superficial in nature and consisted mostly of cracks in brittle surfaces. Contributing factors other than sonic booms were noted in most of the damage cases. There were no reports of direct adverse physiological effects.

R 3

26,127

Sumby, W.H. IMMEDIATE RETRIEVAL OF VERBAL SERIES AS A FUNCTION OF STIMULUS GROUPING. Proj. 7682, Task 768201, ESD TR 64 554, Oct. 1965, 19pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

4 questions were investigated in this study: a) Is the learning rate enhanced if disconnected words are presented visually in clusters, e.g., pairs of quadruples, rather than individually and successively; b) If changes do occur, and in a lawful fashion, can such differences be accounted for adequately in terms of the development of differential interitem association strengths as a function of such stimulus arrangement; c) What differences, if any, become evident in free-recall serial position curves by such organization; d) How is the order of responding affected by clustering?

R 4

26,128

Bragg, V.C. THE INTERPRETATION OF AUDIOMETRIC FINDINGS WITHIN A HEARING CONSERVATION PROGRAM. Proj, BuWeps M7022.03.02 5006, Spec. Rep. 65 8, Dec. 1965, 9pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

A method for interpretation of audiometric data obtained within the Navy's Hearing Conservation Program is presented. An explanation of the various audiometric contours is given, followed by a step-by-step procedure for analyzing the pure tone audiogram. In addition, recommendations are made concerning the disposition of patients whose audiograms do not fall within normal limits. Utilization of these procedures within a comprehensive program of hearing testing, noise control, and education is recommended for all ships and stations whose personnel work in hazardous noise.

26,129

Ekman, Gosta & Franzen, Ove. MEASUREMENT OF THE UNDERLYING PROCESS IN AUDITORY FLUCTUATIONS. Number 201, Dec. 1965, 12pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

A method of measuring the variable intensity of a perceptual process at liminal stimulation is described. It is based on a model involving a random variation in addition to a systematic trend, i.e., it may be characterized as an indirect scaling technique. This technique is applied to data from an experiment with liminal auditory stimulation. A simple periodic function is obtained for each of 4 Ss. The great similarity between the individual functions suggests a process of a general and basic character.

R 27

26,130

Newlin, H.E. & Morris, E.R. DEVELOPMENT OF FOOD BARS EMPLOYING EDIBLE STRUCTURAL AGENTS. Contract DA19 129 QM 1984 (01 6071), Proj. 7X84 06 031, Tech. Rep. FD 20, Rep. 2591 C, Aug. 1965, 82pp. USA Natick Labs., Natick, Mass. (Midwest Research Institute, Kansas City, Mo.). (AD 620884)

Several pastes and a hot melt prepared from edible components were found effective binders for preparation of bars from any combination of dry foods. Effectiveness of these edible binders was demonstrated on bars prepared from different types and compositions of foods. Bars remained acceptable after storage for 3 months at 100°F and retained adequate resistance to impact and shear.

R 2

26,131

Freeman, J.A. MONITORING PSYCHOMOTOR RESPONSE TO STRESS BY EVOKED AUDITORY RESPONSES. Task 793003, SAM TR 65 42, May 1965, 11pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

A sensitive central nervous system (CNS) monitoring technic that can be correlated with behavior and with changes in the surrounding environment during aerospace flight is desirable to the flight surgeon interested in the early detection of possible adverse effects of the flight on the S, to the neurophysiologist concerned with basic cerebral mechanisms occurring during the unique conditions of space flight, and to the systems engineer interested in any redundant indirect measurement of environmental parameters which serve to enhance the total system reliability. In this study, a special-purpose digital computer was used to obtain average EEG responses evoked from human Ss by repetitive, nondistracting clicks during sedentary activity, mildly symptomatic hyperventilation, hypoxia, and 2.5 +G<sub>z</sub> acceleration on the SAM human centrifuge and in an NF-100 aircraft. The waveforms obtained were qualitatively distinct for each group. No appreciable alteration of the relative amplitudes or latencies of the individual response components was caused by distraction, habituation, or variations in ambient noise. No significant effects were detectable in the corresponding EEG's. This preliminary investigation suggests that average evoked responses may be useful and sensitive indicators of CNS activity during aerospace flight.

R 12

26,132

Tedrick, R.N. & Polly, R.C. MEASURED ACOUSTIC PROPAGATION PARAMETERS IN THE MISSISSIPPI TEST OPERATIONS AREA, NASA TM X 1132, Aug. 1965, 50pp. National Aeronautics & Space Administration, Washington, D.C. (George C. Marshall Space Flight Center, Huntsville, Ala.).

To investigate the propagation of sound in the Mississippi Test Operations (MTO) area, MSFC initiated a year-long study using a large exponential horn, a U.S. Weather Bureau radiosonde station, and several portable acoustic monitoring systems. Approximately 100,000 acoustic and 1000 atmospheric measurements were made during calendar year 1963. These were summarized with the aid of a large-scale digital computer to present information on the propagation, refraction, and attenuation of low frequency sound in the area. Curves are presented showing the effects of variations in acoustic velocity gradient, humidity and wind at 40, 80, 120, and 160 Hertz (cps). The persistence and repeatability of these propagation conditions were also investigated and are presented.

R 12

26,133

Stichman, E.P. & Renaud, G.E. INFORMATION EXTRACTION FROM VOICE COMMUNICATIONS: WORK METHODS FOR SINGLE TRANSCRIBERS. DA Proj. 2J024701A723, Tech. Res. Note 154, June 1965, 23pp. USA Personnel Research Office, OCRD, Combat Systems Research Lab., Washington, D.C. (AD 618322)

Studies are conducted by the Combat Communications Task in voice-radio communications techniques and overall performance of personnel involved in communications operations. An experiment was designed to determine the effects of 20 different transcription methods on the performance of 12 Army enlisted men in transcribing word lists received at 4 signal-to-noise levels. 3 aspects of communications procedure were examined: listening to the message, writing the message as it was heard, and using a previous transcript of the message as an aid in re-listening and re-transcribing. Significant improvement in performance was obtained when Ss both listened to and wrote the word lists more than once. Performance did not improve at any signal-to-noise ratio when listening to a given word list more than once before writing the transcript nor when the Ss used a first or second transcript as a reference aid in re-transcribing a word list. Conclusion was that although the actual absolute gain in accuracy was low, there was sufficient improvement to warrant repeated listening and repeated writing of messages when reception conditions are below the marginal level of channel communications.

R 6

26,134

Chaney, R.B., Jr. & Webster, J.C. INFORMATION IN CERTAIN MULTIDIMENSIONAL ACOUSTIC SIGNALS. Proj. SR 006 09 02, Task 11281 (NEL N 51461), NEL Rep. 1339, Dec. 1965, 52pp. USN Electronics Lab., San Diego, Calif.

Does 0 experience affect speed and accuracy of identification of sound? A trained group and an untrained group are tested with speech and sonar signals varying in 5 dimensions--quality, inflection, duration, frequency, and source. Difficulty of identification of each dimension is shown to vary with both experience of listener and nature of signal, but perception of various multidimensional signals is shown to depend mainly upon experience of listener. Sonar training further seems to increase skill in recognition of at least 1 speech dimension.

R 51

26,135

Pfeiffer, M.G. & Siegel, A.I. POST-TRAINING PERFORMANCE CRITERION DEVELOPMENT AND APPLICATION. PERSONNEL PSYCHOPHYSICS--INITIAL STUDIES INTO PSYCHOPHYSICAL SCALING OF ELECTRONICS JOB COMPLEXITY. Contract Nonr 2279(00), March 1965, 45pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Applied Psychological Services, Wayne, Penn.).

Magnitude and category psychophysical scaling methods were employed by journeymen electronics personnel to scale the apparent complexity of various aspects of their own job. The resultant data indicated that essentially equivalent scales were produced across the methods and that the continua of perceived complexity of 4 "activity" stimuli and of 16 "circuit" stimuli were metathetic. This latter conclusion was based on the relative homogeneity of interindividual discriminial dispersions for all the stimuli and also on the linear relation between the scales resulting from category and magnitude scaling procedures. The absence of large distortions as the result of the introduction of different methods suggested support for a single psychophysical law in the avionic job performance area.

R 25

26,136

McGee, V.E. FINAL REPORT ON CONTRACT NONR 3897(05) TO DARTMOUTH COLLEGE, HANOVER, N.H. 15 APRIL 1963 TO 14 APRIL 1965. July 1965, 34pp. Dartmouth College, Hanover, N.H.

This final report is a summary of the major results of several studies conducted under the project "Affective Communication in Speech and Related Quantitative Problems." The overall orientation of the research was to investigate by various means those kinds of information in speech which do not deal directly with the actual message per se, i.e. affective information. The goal, therefore, was to determine the acoustical properties of the speech signal which are identified with various perceptual responses to that signal. Specific topics include: semantic components of the quality of processed speech, determining perceptual spaces for the quality of filtered speech, modified canonical correlation approach for a particular problem, multidimensional analysis of elastic distances, and invariance of personal characteristics of voice over 2 vowel sounds. (HEIAS)

R 16

26,137

Bauer, R.W. & Blackmer, R.F. AUDITORY LOCALIZATION OF NOISES. AMCMS Code 5011.11.841, Tech. Memo. 4 65, Jan. 1965, 25pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This report summarizes 3 studies of unaided auditory localization of fixed noise sources. Pointing was as accurate as aiming at auditory targets in darkness. Elevation errors were not significantly larger than azimuth errors. Ss with hearing deviations (defects) performed as well as non-deviant Ss (normals) in auditory localization.

R 4

26,138

Jones, J.H., Berman, R.J. & Weichbrodt, B. RESEARCH STUDY OF THE BIOMEDICAL ASPECTS OF AEROSPACE SYSTEMS ENVIRONMENTAL CHAMBER MARK I. PHASE VI. RAPID REPRESSURIZATION OF SPACE SIMULATION CHAMBERS. VOLUME III. Contract AF 40(600) 1012, Proj. 7778, AEDC TR 65 179, Aug. 1965, 141pp. USAF Arnold Engineering Development Center, Arnold AF Station, Tenn. (Missile & Space Div., General Electric Company, King of Prussia, Penn.). (AD 469040)

Trouble free rapid repressurization of space simulation chambers is possible using a simple easily obtained muffler. Expected adverse dynamic and acoustic phenomena were eliminated during chamber tests. Heat transfer during the repressurization period was by forced convection; free convection predominated afterwards. Fogging occurs during ambient air repressurization when the cryowall is cold. An open cycle fan-heater system should eliminate this fog annoyance.

R 19

26,139

Borsky, P.N. COMMUNITY REACTIONS TO SONIC BOOMS IN THE OKLAHOMA CITY AREA. FINAL REPORT. AIRC 1963-FEBRUARY 1965. Contract AF 33(657) 11148, Proj. 7231, Task 723103, AMRL TR 65 37, NORC Rep. 101, Feb. 1965, 50pp. USAF Biophysics Lab., Wright-Patterson AFB, Ohio. (National Opinion Research Center, University of Chicago, New York, N.Y.).

The Oklahoma City, Oklahoma, area was repeatedly exposed to sonic booms generated by a simulated schedule of supersonic transport overflights during a period of 6 months from February to July 1964. The schedule provided for 8 sonic booms per day programed at an intensity of 1.5 lbs per square foot (PSF) during the first portion of the study and 2.0 PSF during the latter stages. Almost 3000 local residents were personally interviewed 3 times during the 6-month period to determine the nature and extent of their reactions to the sonic booms. Among the findings it was shown that substantial numbers of residents reported interruptions of ordinary living activities, and some annoyance with these interruptions, however, the overwhelming majority felt they could learn to live with the numbers and kinds of booms experienced during the 6-month study.

26,140

Garinther, G.R. & Kryter, K.D. AUDITORY AND ACOUSTICAL EVALUATION OF SEVERAL SHOULDER-RIFLES. AMCMS Code 5011. 11.841, Tech. Memo. 1 65, Jan. 1965, 59pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

The threshold of audibility of each ear of 178 soldiers was measured before and after firing various types of shoulder rifles at the rate of 1 trigger pull every 5 sec. The acoustical impulses from each type of weapon were evaluated (peak pressure, time history, and spectrum). The peak pressures of the acoustic impulses from firing the weapons were highly correlated with threshold shifts caused by exposure to the gun noise. From these and related data, estimates are made of the expected permanent hearing level in the frequency region from 1000 cps to 6000 cps to be equalled or exceeded in 50, 25, & 10% of ears repeatedly exposed to gun noise at various peak sound-pressure levels.

R 6

26,141

Garinther, G.R. & Moreland, J.B. TRANSDUCER TECHNIQUES FOR MEASURING THE EFFECT OF SMALL-ARMS' NOISE ON HEARING. AMCMS Code 5011.11.84100, Tech. Memo. 11 65, July 1965, 59pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This study investigated several types of transducers which might be considered for use when evaluating the hearing hazard of pressure waves that small arms produce. In measuring the small arms' peak sound-pressure level, error was directly proportional to the measured rise time and inversely proportional to the positive pressure duration of the wave. The most accurate results were obtained by positioning the transducers vertically, with the pressure wave grazing the sensing surface at 90° incidence. Moreover, there was good agreement between measurements made with a wide-band piezoelectric transducer and those made with a wide-band condenser microphone. Finally, pistonphone calibrations at low levels (127 db) compare favorably with shock-tube calibrations at high levels (170 to 180 db).

R 4

26,142

Borsky, P.N. COMMUNITY REACTIONS TO SONIC BOOMS IN THE OKLAHOMA CITY AREA. VOLUME II. DATA ON COMMUNITY REACTIONS AND INTERPRETATIONS. FINAL REPORT APRIL 1963-FEBRUARY 1965. Contract AF 33(657) 11148, Proj. 7231, Task 723103, AMRL TR 65 37, NORC Rep. 101, Part 2, Oct. 1965, 300pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (National Opinion Research Center, University of Chicago, New York, N.Y.).

During a period of 6 months from February to July 1964, the Oklahoma City, Oklahoma, area was repeatedly exposed to sonic booms generated to simulate overpressure levels that are expected for supersonic transport overflights. The schedule provided for 8 sonic booms per day. During the 6-month period, almost 3,000 local residents were interviewed 3 times to determine the nature and extent of their reactions to the sonic booms. This report contains a detailed description of the overall study design including the selection of households, selection of respondents, training and selection of interviewers and samples of questionnaires used during the interviews. Among the findings it was determined that ordinary living activities were often interrupted by sonic booms, but that a majority of the residents felt they could learn to live with the interruptions. A substantial number of residents felt they had sustained damages from the booms, although detailed engineering observations of structures in the area did not confirm most of these reports. As the intensity of the booms increased, acceptance of the booms by residents was reduced. Residents who felt that the development of a commercial supersonic airplane was important were more likely to accept the exposures to the sonic booms.

R 16

26,143

Shoenberger, R.W. & Harris, C.S. HUMAN PERFORMANCE AS A FUNCTION OF CHANGES IN ACOUSTIC NOISE LEVELS. FINAL REPORT JUNE 1964-FEBRUARY 1965. Proj. 1710, Task 171002, AMRL TR 65 165, Dec. 1965, 11pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Psychomotor performance of 16 Ss was evaluated under 4 noise conditions, during 4 test sessions, in a Latin square design. 3 experimental conditions each began with different intensities of noise (Quiet, 85 dB, or 95dB). After 30 minutes exposure the noise was changed to a final high intensity level (110 dB), which lasted for 15 minutes. The fourth condition served as a control, in which Quiet prevailed throughout the entire 45 minute period. The results partially supported the hypothesis that greater changes in noise levels produce greater decrements in performance. There was, however, a strong interaction between noise conditions and sessions. The nature of this interaction indicated that this phenomenon does not occur uniformly throughout the course of learning, and probably is of lesser importance for well learned tasks.

R 19

26,144

Deatherage, B.H. (Proj. Dir.). SUMMARY REPORT. 1 APRIL 1964 TO 1 APRIL 1965. Contract Nonr 4193(00), TRACOR 65 181 U, April 1965, 30pp. Tracor, Incorporated, Austin, Tex.

Critical bands have been obtained for click stimuli and found to be similar to those for tones. The stimuli were specified by waveform and power spectrum. It is suggested that the utilization of this specification might explain the discrepancy which exists in the literature on localization between trading ratios for clicks and tones.

R 37

26,145

Griffiths, J.D. SPEECH COMMUNICATIONS FROM AN INFORMATION THEORY VIEWPOINT. (Ph.D. Dissertation, Graduate School, Syracuse University, Syracuse, N.Y.). Contract AF33(608) 1116, Jan. 1965, 153pp. Syracuse University, Syracuse, N.Y. (AD 612264)

The traditional design criteria for a speech communications system is a bandwidth of 2-3 KCPS and a signal to noise ratio of up to 30 db. If low S/N ratios are anticipated some sort of amplitude limiting or compression is often included. Design parameters are decided from empirically derived criteria with little or no consideration as to the information-carrying attributes in speech. In contrast, speech is treated here as a sequence of discrete code elements, the phonemes. The entropy of phonemes and spoken words is examined as a function of the length of intersymbol influence and size of spoken vocabulary. Bounds for word entropy are established in certain cases. Using the known perceptual cues of the phonemes and their characteristics, a decision sequence is constructed to uniquely determine any phoneme. An average "information spectral density" for all phonemes is found by adding together the densities for each phoneme, each weighted by its frequency of occurrence. This is shown to be equivalent to an "information rate spectral density" except for a scale factor, the mean duration of a phoneme. A second "information rate spectral density" is derived for words and connected discourse from the equal articulation band method, as reported in the literature, and the 2 densities are compared. Using the information rate spectral density and the power spectral density of speech an optimum linear filter for processing speech prior to transmission through a power limited channel with additive Gaussian noise is derived. It is believed that the concept of an "information rate spectral density" offers a rational approach to the optimization of speech communications, and perhaps other analog systems as well. This concept offers an insight into the analog signal communications process that is not afforded by statistical operations on the time waveform.

R 112

26,146

Coles, R.R.A. & Knight, J.J. FURTHER AUDIOMETRIC TESTS OF FLIGHT-DECK PERSONNEL OF H.M.S. VICTORIOUS, 1962-64. (FOLLOW-UP OF AUDIOMETRIC SURVEY OF FLIGHT-DECK PERSONNEL OF H.M.S. VICTORIOUS-RNP 60/990). RNP 65/1053, He.S. 98, Copy 77, March 1965, 6pp. Royal Naval Personnel Research Committee, MRC, London, England.

This report concerns the results of a follow-up examination of a group of 22 naval airmen who, in January 1960 after intense jet-noise exposure, showed a slight median hearing loss compared with their hearing level when tested in 1958 under identical conditions. Although in the meantime 16 of them had served further considerable periods in aircraft carriers, the whole group of 22 showed substantially normal hearing at the final retest more than 2 years later. These findings are discussed in the light of the different noise-exposure and ear protection conditions which obtained before the final retest, and of a longer time available for recovery.

R 4

26,147

Gibson, J.S. C-141A INTERIOR ACOUSTICAL NOISE MEASUREMENTS - A/C #6004 (AF 612778). Contract AF 33(600) 42941, Rep. ER 4932, Sept. 1965, 50pp. Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga. (AD 469657)

This report presents the measured acoustical noise environment for the interior of the C-141A aircraft and a description of the production soundproofing treatment as required by MIL-A-8806. The measured acoustical noise environment for the required flight conditions is well below specification limits in most octave bands. There are a few insignificant instances where the measured noise levels exceed the specification by one or two decibels.

R 4

26,148

McGee, V.E. DETERMINING PERCEPTUAL SPACES FOR THE QUALITY OF FILTERED SPEECH. J. Speech & Hear. Res., March 1965, 8(1), 23-28. (Dartmouth College, Hanover, N.H.). (Reprint)

Using 1 recorded voice, distorted in 15 different ways, a sample of listeners made similarity-with-respect-to-quality judgments for the complete paired comparison schedule. By means of an Eckart-Young type factoring procedure, 4 points of view among the listeners were isolated and the perceptual spaces for these points of view were determined. An implication of the "mean" point of view was the operation of 2 response sets labeled "lowest harmonics--YES" and "lowest harmonics--NO".

R 9

26,150

Thai-US Military Research & Development Center. VILLAGE SECURITY PILOT STUDY NORTHEAST THAILAND. ANNEX A. AIR PHOTOGRAPHS AND SCALE SKETCHES OF THE VILLAGES. Rep. 65 002, May 1965, 100pp. Thai-US Military Research & Development Center, Bangkok, Thailand. (AD 473531)

The report consists of air photographs and scale sketches of the villages in Northeast Thailand. The sketches included here show perimeter outlines and the location of roads or cart tracks. They are called sketches for the purposes of the analysis because the chosen perimeters and roads are approximated by straight-line segments. Roads have been drawn as an aid in visualizing village configurations when comparing the sketches with the photographs, and usually only within the Minimum Defense Perimeter, in order to prevent confusion. Sometimes a road location corresponds to that of a perimeter outline. It is recommended that, in any work of a similar kind, more care be taken with the photography.

26,151

Spogen, L.R. (Proj. Dir.). EFFECT OF ERRORS ON SPEECH INTELLIGIBILITY & QUALITY WHEN USING SELECTIVE AMPLITUDE SAMPLING. SUPPLEMENT IV TO FINAL REPORT, AD 453 724. Contract DA 36 039 SC 80872, USAERDAA Subtask IG6 41209 D534 30/03, Tech., Rep. ECOM 80872 IV, (USAERDAA ELCT 5 65), Nov. 1965, 19pp. USA Electronics Research & Development Activity, Fort Huachuca, Ariz.). (Applied Research Lab., University of Arizona, Tucson, Ariz.). (AD 476203)

In the performance of this contract, it was necessary to test the processed aperiodic-sampled speech signal. Psycho-physical tests for quality and intelligibility were employed. This report defines the testing techniques employed. A discussion of the balanced paragraph and intelligibility word lists are included. Appendix A contains the complete set of word lists that were used. The processing of the aperiodic-sampled signal included time and amplitude quantization. The scores obtained for these processing techniques and the processing of pre-emphasized speech is contained in this report. In testing a system of the nature, it is necessary that the errors introduced have the same statistical characteristics as errors resulting from crosschannel interference. The computer testing required for this operation is also explained in this report.

26,152

Gayne, W.J. AURAL DETECTION OF AN AERIAL VEHICLE OPERATING AT LOW ALTITUDES. Report from: "AIAA Second Annual Meeting, San Francisco, California, July 26-29, 1965." AIAA Paper 65 329, July 1965, 16pp. Research Analysis Corporation, McLean, Va.

The distance at which an aerial vehicle can be aurally detected is primarily influenced by: the frequencies and sound pressure levels of the noise generated by the vehicle, the propagation characteristics of sound as influenced by the terrain and vegetation over which the sound travels, the altitude at which the vehicle is operating, the ambient noise level at the point of detection, and the response characteristics of the listener. In this paper a generalized equation for estimating the aural detection distance associated with given vehicle noise levels is developed. Detection distance can be minimized by operating a vehicle at low altitude and over terrain well-covered with vegetation. The designer should concentrate on minimizing noise with a frequency below 150 cps. The warning time, or time interval, between initial detection of an approaching vehicle and the arrival of the vehicle over the listener is based on the velocity of the vehicle's approach and the distance at which it is initially detected. Equations which relate noise level, detection distance, vehicle velocity, and warning time are developed. Analytical and graphical solutions are given. An illustrative example is solved.

R 9

26,153

Brogan, F.A. A SEMIAUTOMATIC AUDIOMETER UTILIZING PATTERN ADJUSTMENT IN 2.5-DECIBEL STEPS. Task 775503, SAM TR 65 36, May 1965, 7pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 466471)

A semiautomatic, auditory-threshold measuring technic is discussed. It allows the S to determine his threshold by adjusting the pattern of the auditory stimulus. Apparatus and test results comparing this technic with Bekey audiometry are presented. The test results indicate that this method is comparable to Bekey audiometry in test-retest reliability and that the mean test time is about the same as that obtained with the Rudnose version of the Bekey technic.

R 23

26,154

USAF 1st Combat Applications Group. EVALUATION OF C-123 AIRCRAFT LOUDSPEAKER SYSTEM. FINAL REPORT, 18 JUNE 1964-SEPTEMBER 1964. ICAG Proj. 2C 19, SAWC TDR 65 2, May 1965, 36pp. USAF 1st Combat Applications Group, SAWC, Eglin AFB, Fla. (AD 463326)

A loudspeaker system installed in a C-123 aircraft was evaluated to determine its capability for direct air-to-ground broadcasts during emergencies or civic action efforts. The evaluation revealed that the C-123 aircraft loudspeakers provide good quality reception at altitudes up to 3000 ft. At altitudes above 3000 ft, audibility decreases, resulting in ineffective broadcasts above 5000 ft. Ground coverage from broadcasts at 3000 ft. consists of a circular area 1/2 NM in diameter. Usable altitude and distance from target are limited by density of the medium through which the sound wave must travel. Wave propagation is inversely proportional to temperature. Individual speech characteristics also affect the signal intelligibility.

26,155

Black, J.W. PREDICTING THE INTELLIGIBILITY OF WORDS III. Report from: "Proceedings 5th International Congress Phonetics Sciences, Munster, 1964." (S. Karger, Basel, New York, N.Y.). Contract Nonr 495(18), Proj. NR 145 993, 1965, 215-217. Ohio State University Research Foundation, Columbus, Ohio. (Reprint)

The present data suggest that the relative intelligibility of a phoneme is a stable phenomenon; further that this characteristic can be demonstrated with few listeners, few speakers, and a limited number of words. Currently, this outcome is based on 5 speakers, 5 listeners, and 300 words, a combination that yielded 10,000 responses to simple words. Possibly more results are to be expected.

R 2

26,156

Fornwalt, N.E. INVESTIGATION INTO THE EFFECT OF INTERMITTENT NOISE OF CONSTANT PERIODICITY VS. RANDOM PERIODICITY ON THE PERFORMANCE OF AN INDUSTRIAL TASK. (M.S. Thesis presented to Faculty, Texas Technological College, Lubbock, Tex.). Contract AF 33(608) 1119, May 1965, 108pp. Engineering School, Texas Technological College, Lubbock, Tex. (AD 611788)

An investigation of the effect of noise of varying periodicity of presentation on the performance of a task involving a sensorimotor factor and a simple decision factor was performed. The experimental design included the independent variables of sex, age, replication (of Ss), noise periodicity, noise intensity, and trials. A total of 72 Ss was used in the experiment. Dependent variables were: total errors per trial, total responses per trial, total wrong switch errors (decision errors) per trial, and mean latency of responses. Separate analyses of variance were performed for each dependent variable. The results indicated that the effect of noise periodicity was significant in the analysis of wrong switches--random and periodic noise retarded learning rate in the early trials but performance differences were slight between intermittent and continuous noise in later trials. Interactions involving noise type indicate that random noise produced more deleterious effects than periodic, and that both types had more adverse effects than continuous. Levels above 90 db showed the most deleterious effects, however noise intensity was not a significant main effect in any of the analyses. HEIAS

R 14

26,157

Pearsons, K.S. & Kryter, K.D. LABORATORY TESTS OF SUBJECTIVE REACTIONS TO SONIC BOOM. Contract NASR 58, NASA CR 187, March 1965, 34pp. National Aeronautics & Space Administration, Washington, D.C. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

20 Ss compared, in a special laboratory chamber, the subjective acceptability or noisiness of sonic booms (simulated) that would be heard outdoors and indoors with the sound of subsonic jet aircraft and bands of filtered white noise. The subjective acceptability of the booms was expressed in terms of equivalent perceived noise level in PNdB. (The use of this procedure does not imply that a "PNdB" value can, or should, be calculated for a sonic boom; the PNdB values used refer to the calculated peak perceived noise level of the flyover sound of a subsonic jet aircraft that is judged to be subjectively as acceptable as a given sonic boom.) When heard indoors, a sonic boom having an outdoor level of 113 PNdB; the same boom heard outdoors was judged to be less noisy by an equivalent of 17 PNdB than the sound of subsonic jet at 113 PNdB. Some factors involved in estimating community response to aircraft noise are discussed.

26,158

August, R.D. (Proj. Dir.). FEASIBILITY STUDY OF A SYNTHETIC SPEECH SIGNAL TEST SET. FINAL REPORT JUNE 1964-MARCH 1965. Contract DA 02 086 AMC 0057(E), DA Task 1E6 34301 D244 03, Tech. Rep. ECOM 00057 F, (USAFERDA ELCT 13 65), May 1965, 92pp. USA Electronics Research & Development Activity, Electronics Dept., Fort Huachuca, Ariz. (Applied Research Lab., University of Arizona, Tucson, Ariz.).

A procedure is outlined for developing a test signal that is statistically representative of voice messages. A device is outlined in general principle for scoring the intelligibility of the test signal when it is received through a voice communications channel. Some of the 1st results are presented from the basic experiment conducted to identify the parameters of a vowel sound which are significant to the intelligibility of such a sound. These results are highly encouraging, and as a consequence, a proposal has been prepared to continue the study. In addition, an extensive bibliography of pertinent literature used in the project has been included.

R 146

26,159

Black, J.W., Singh, S., Tosi, O., Takefuta, Y. et al. SPEECH AND AURAL COMPREHENSION OF FOREIGN STUDENTS. *J. speech hear. Res.*, March 1965, 8(1), 43-48. (Ohio State University, Columbus, Ohio). (Reprint)

Each of 3 groups of university students for whom English was a 2nd language, 24 Japanese-, 24 Hindi-, and 24 Spanish-speaking students, was divided into subgroups on the basis of efficiency in aural comprehension. All of the students recorded lists from an English-language intelligibility test and short segments of English prose. 3 sets of measures were obtained: a) intelligibility scores; b) ratings of foreignism in speech; and c) the amount of vocalized time in a set reading task. The object of the study lay in relating aural comprehension to other manifestations of speech behavior, not in comparing the 3 groups of students. Relative skill in aural comprehension was found to differentiate each language group in intelligibility, in degree of foreignism, and in vocalized time as well.

R 9

26,160

Harris, C.M. & Tempest, W. ABSORPTION OF SOUND IN AIR BELOW 1000 CPS. Contract NAS 8 11002, NASA CR 237, June 1965, 58pp. *National Aeronautics & Space Administration*, Washington, D.C. (Columbus University, New York, N.Y.).

For many acoustic problems associated with the propagation of sound which is generated by launch vehicles, it is important to have accurate data of absorption of sound in air as a function of atmospheric conditions such as temperature, pressure, and humidity. Accurate data of this type have not been available below 2000 cps. Hence the purpose was to extend to lower frequencies the present range of reliable air absorption data. This report presents such information in the frequency range from about 125 cps to 1000 cps at 20°C, 0°C, -20°C, & -40°C. The data described in this report can be applied to studies of acoustic propagation in the atmosphere in addition to the problem of establishing a theoretical model of sound absorption in air. In this connection measurements were made of the absorption in mixtures of O<sub>2</sub> and water vapor and also in mixtures of O<sub>2</sub> and deuterium oxide.

R 11

26,161

Luria, Zella. EXPERIMENTS OF A POSTURAL AUTOKINETIC EFFECT. *J. Psychol.*, May 1965, 60(First Half), 87-101. (Psychology Dept., Tufts University, Medford, Mass.).

6 groups of Ss responded to a darkroom situation with and without suggestion of movement introduced by the experimenter. 1 group, given verbal suggestion of movement, reported movement significantly more frequently than did groups which received no verbal suggestion of movement. A 2nd group, given neutral instructions, reported significantly fewer movement responses than did all groups which received suggestion instructions. A retest of Ss in the 2nd group, with the suggestion of movement, showed that both the suggestion and the previous experience affected the group's movement responses. A 3rd group yielded results indicating that the use of auditory stimulation did not determine the frequency of movement response. The final groups present evidence of the efficacy of apparatus as a means of introducing suggestion of response. Ss given suggestion instructions were found to be less responsive to stimuli unrelated to the suggestion than were other experimental groups; suggestion instructions seem to define the limits of the Ss' attention. Ss reporting movement were found to be no more highly susceptible to motion sickness than were Ss not reporting movement. Results are discussed in terms of the use made by the S of instructions to help structure ambiguous-stimulus conditions. A possible role played by small head movements in perception of body movement is also suggested.

R 10

26,162

King, H.E. THE RETENTION OF SENSORY EXPERIENCE: IV. SHORT-DELAY VERSUS LONG-DELAY INTERVALS. *J. Psychol.*, May 1965, 60(First Half), 103-115. (Western Psychiatric Institute & Clinic, University of Pittsburgh School of Medicine, Pittsburgh, Penn.).

The accuracy with which human Ss can reproduce sensory experiences of brightness, flash rate, loudness, pitch, and duration have been observed for delay intervals of 15, 30, & 60 sec. Standard stimuli, presented under controlled conditions, were matched by the method of successive comparison by manual adjustment of variable stimuli following delay. The matches made to original (standard-stimulus) values were notably accurate and stable over all delay periods observed. When trends appeared in the constant errors obtained, they were consistent in both direction (sign) and degree with the errors observed over much longer delay intervals (1 to 28 days) using identical test methods.

R 9

26,163

Cautela, J.R. & McLaughlin, D. THE INFLUENCE OF SUGGESTION ON THE AUDIOAUTOKINETIC EFFECT. *J. Psychol.*, May 1965, 60(First Half), 117-122. (Psychology Dept., Boston College, Chestnut Hill, Mass.).

Preliminary observations on a possible auditory autokinetic effect are discussed. In an early study Ss were presented with relatively pure tones and were given varying instructions as to what characteristics of the sound to report. In all conditions Ss reported some special displacement of the sound. In the present study the above experiment was replicated with 2 additional conditions. The S's head was placed in a head rest, allowing little or no movement of the head. The sound source was placed about S's head along the midline. Both of these conditions reduced localization cues. 40 Ss, in 4 groups of 10, participated in the experiment. 4 groups were used to investigate the effect of different instructions (degrees of suggestibility of movement) on the possible occurrence of AAE. A tone of 500 cycles and 35 db was presented for 2 min. At the end of the 2 min. period, the 550 cycle tone was presented again with an amplitude of 70 db. 2 significant conclusions are: a) that an audiokinetic effect similar to the visual autokinetic effect is attainable; and b) the effect obtained is influenced by the degree of suggestion of the possibility of movement. (HEIAS)

R 8



26,164

Frost, B.J. SUBJECTIVE COLORS: AN OBJECTIVE-COLOR ARTIFACT. *J. Psychol.*, July 1965, 60 (Second Half), 251-254. (Psychology Dept., Dalhousie University, Halifax, Nova Scotia, Canada).

The author reports a previous experiment in which a new method for producing "subjective colors" was presented. The method consisted essentially of stroboscopically illuminating a rotating black and white patterned disc. When light from a fluorescent source was pulsed at the same frequency as a rotating half-white and half-black disc, an orange-yellow color appeared to cover the black section of the disc, while a well-saturated blue was seen to precede it. The present experiment is a replication of the earlier study, but, in addition, color photographs were taken of the disc under observation conditions, and a comparison of Ss' spectrometer matchings was made with the spectral output of the light source. When the disc was rotated at 3600 rpm under fluorescent light "brownish-yellow" and "blue" triangles appeared partly superimposed on each other to form a star shape. The 5 Ss' mean spectrometer settings in m $\mu$  for the blue hue ranged from 469 to 486; for the yellow hue from 601 to 612. The results of this study indicate that subjective color experiments may be confounded by the presence of objective colors when fluorescent light sources powered by AC current are used. (HEIAS)

R 1

26,165

Wortz, C.E. & McTee, A.C. S-R RELATIONSHIPS AND TRANSFER OF TRAINING. *J. Psychol.*, July 1965, 60 (Second Half), 277-282. (Air Research Manufacturing Div., Garrett Corporation, Los Angeles, Calif.).

Several theoretical relationships between training test similarity and interference with transfer are discussed. A curvilinear relationship between similarity and facilitation, with greatest facilitation at maximum similarity and minimum similarity, was hypothesized. The purpose of the present experiment was to ascertain the effect of training and test similarity on difficulty of transfer for the paradigm in which no new stimuli or responses are employed in the test period. Only simple rearrangements of previously learned S-R relationships were provided. 35 Ss were required to learn the correct switch position (left or right) in response to a pattern of 2 lights in a random series of all possible (i.e., 15) 2-light patterns in a 3-by-2 matrix of orange lights. After reaching the criterion, the correct response was reversed for a certain percentage of the light patterns. Then the correct response for either 20, 40, 60, 80 or 100% (3, 6, 9, 12, or all 15) of the patterns were reversed and Ss relearned to the same criterion. Transfer for the 20% reversal group was significantly faster than that for the 40% group or the 60% group, but is not significantly different from that for the 80% group or 100% group. Consequently, a curvilinear function between transfer (reversal) difficulty and the number of S-R relationships altered is established. (HEIAS)

R 7

26,166

Brown, D.W. & Friedman, H.D. VISUAL-CHARACTER DETECTION. *J. Psychol.*, July 1965, 60 (Second Half), 295-300. (Applied Research Lab., Sylvania Electronics System, Sylvania Electric Products, Inc., Waltham, Mass.).

A specific application of work in pattern recognition is the automation of the task of the photo-interpreter. 1 approach is to describe the functions of the human photo-interpreter and to build a device that performs those functions. The research reported is a 1st attempt to describe the performance of Ss faced with a detection task. In this study, the authors investigate detection performance when the stimulus to be detected is a "C" in a 16-by-16 matrix of "Gs". 2 studies were conducted, with the 4 Ss in the 2nd experiment being selected on the basis of performance in the first. Results indicate that for individuals who are relatively proficient at the type of task studied, the position of the stimulus with respect to vertical and horizontal placement is an important determinant of detection time. For individuals of low proficiency, position has no effect.

26,167

Gunderson, E.K.E. & Nelson, P.D. BIOGRAPHICAL PREDICTORS OF PERFORMANCE IN AN EXTREME ENVIRONMENT. *J. Psychol.*, Sept. 1965, 61 (First Half), 59-67. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif.).

In this study, the authors assessed relationships between biographical data and performance evaluations for Navy participants in the United States Antarctic Research Program. Prior to deployment to Antarctica, 425 Navy men completed a biographical questionnaire eliciting information concerning military record, interests and hobbies, family and educational background, and vocational experience. After approximately 1 yr. at an Antarctic scientific station, performance evaluations were obtained from station supervisors and peers. Results from earlier samples (predominantly from large stations) indicated that age, rank, years of naval experience, marital status, worship, delinquency, and amount of reading were significantly related to peer evaluations of adjustment. Results from small-station groups, analyzed in the present study, reveal important differences in the attributes that are correlated with performance criteria.

R 6

26,168

Cameron, Jean S., Specht, Priscilla G. & Wendt, G.R. EFFECTS OF AMPHETAMINES ON MOODS, EMOTIONS, AND MOTIVATIONS. *J. Psychol.*, Sept. 1965, 61 (First Half), 93-121. (Psychology Dept., University of Rochester, Rochester, N.Y.).

9 experiments conducted over a period of 10 yrs. on 239 normal college student Ss, 21 yrs. or older, with essentially identical procedures, to find the effects of amphetamines on moods, emotions, and motivations as determined by free-choice adjective check lists and forced-choice ACLs are here reported. Ss, given a normal clinical dose, like the way the drug makes them feel and are more optimistic, friendly, energetic, talkative, decisive, egotistic, keyed-up, and light-headed, at the same time that they are less drowsy, languid, bored, dissatisfied, depressed, or grouchy. A drug-placebo comparison showed  $t$  values as high as 8.3. Replication of experiments showed how sensitivity varied from year to year. Both ACLs yielded good sensitivity in each experiment, but the sensitivity of the forced-choice ACLs was less variable. Replication from a qualitative point of view (i.e., the extent to which the change in specific moods, emotions, and motivations was the same from year to year) was measured by correlations of  $r=+.20$  to  $r=+.77$  for the free-choice ACL and  $r=+.77$  to  $r=+.97$  for the forced-choice ACL. The lowest correlations involved data using small doses or a small number of Ss. Data of methodological importance are presented, including placebo data and data on variability of emotional states. Data on Dramamine are presented for comparison.

R 4

26,169

Nelson, P.D. & Berry, N.H. CHANGE IN SOCIOMETRIC STATUS DURING MILITARY BASIC TRAINING RELATED TO PERFORMANCE TWO YEARS LATER. *J. Psychol.*, Nov. 1965, 61(Second Half), 251-255. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, California).

In a sample of male enlisted marines, peer nominations obtained during the 2nd & 10th weeks of basic training were analyzed in relation to 2-yr. performance measures of military conduct and proficiency. The primary purpose of the study was to ascertain the extent to which change in sociometric status during training might be of value as a predictor of post-training behavior. Change in status, inferred to be a measure of individual development during training, was significantly related to proficiency but not uniquely to military conduct. Peer evaluations obtained early were as valid as those obtained later in training when prediction was made to 2-yr. conduct. On the other hand, the validity of peer evaluations with technical proficiency appears to increase as the training period unfolds.

R 6

26,170

Mayzner, M.S., Adler, S., Cohen, A. & Schoenberg, K.M. A STUDY OF THE EFFECTS OF IRRELEVANT INFORMATION ON THE SHORT-TERM RETENTION OF RELEVANT INFORMATION. *J. Psychol.*, Nov. 1965, 61(Second Half), 257-262. (Industrial Engineering & Operations Research Dept., New York University School of Engineering & Science, Bronx, N.Y.).

The present study, in a series of 5 experiments employing 200 Ss, examined the effects of irrelevant information of the short-term retention of relevant information. The basic task involved presenting to S a vertical array of either 9 digits, 9 high-frequency consonants, or 9 low-frequency consonants alone, or embedded in increasingly larger matrices of irrelevant digits or high- or low-frequency consonants, and then measuring recall of the relevant items as a function of the number and kind of irrelevant items. The results clearly showed that for all combinations of relevant-irrelevant matrices (i.e., numbers-numbers, numbers-letters, letters-numbers, letters-letters, etc.) no systematic or significant decrements or increments in performance were found, and it was concluded that S is able to attend exclusively to the relevant stimuli.

R 10

26,171

Briggs, G.E. & Naylor, J.C. TEAM VERSUS INDIVIDUAL TRAINING, TRAINING TASK FIDELITY, AND TASK ORGANIZATION EFFECTS ON TRANSFER PERFORMANCE BY THREE-MAN TEAMS. *J. appl. Psychol.*, Dec. 1965, 49(6), 387-392. (Ohio State University, Columbus, Ohio).

Transfer performance of teams was measured in a simulated radar-controlled aerial intercept task. Superior performance occurred after training on an independently organized task (as compared to that after training which required verbal interaction among controllers), and superior performance occurred in an independently organized transfer task. However, these 2 variables interacted such that performance on an interaction condition of the transfer task was equivalent to that on an independently organized task if prior training was under the independent task organization. Training task fidelity influenced performance only on the interaction transfer task, with superior performance following a high-fidelity training situation in which controllers could acquire the same skills to be required in transfer for communication to interceptor pilots.

R 5

26,172

Smith, S.L., Farquhar, Barbara B. & Thomas, D.W. COLOR CODING IN FORMATTED DISPLAYS. *J. appl. Psychol.*, Dec. 1965, 49(6), 393-398. (Mitre Corporation, Bedford, Mass.).

An experiment was designed to assess and compare the effects of symbolic, numeric, and color coding in formatted displays. 12 Ss viewed displays in which 2-digit entries were arranged in tabular matrix format. Displays differed in density, structure, and auxiliary coding. Ss performed row-comparison and item-counting tasks, providing time and error measures. Auxiliary color coding resulted in better performance than superscript or underline codes for both tasks. Color coding was relatively more effective for item counting than for row comparison where the display format was related to the task. The value of a display code appears to be dependent upon the joint interaction of the format in which it is displayed and the task to which it is applied.

R 6

26,173

Taylor, C.W., Price, P.B., Richards, J.M., Jr. & Jacobsen, T.L. AN INVESTIGATION OF THE CRITERION PROBLEM FOR A GROUP OF MEDICAL GENERAL PRACTITIONERS. *J. appl. Psychol.*, Dec. 1965, 49(6), 399-406. (University of Utah, Salt Lake City, Utah).

The sample consisted of 217 general practitioners of the state of Utah. 80 scores relevant to the performance of these physicians were collected from a variety of scores, inter-correlated, and factor analyzed using the principal components solution based on eigenvalues and eigenvectors. The 30 factors which had an eigenvalue greater than 1.00 were rotated by the varimax procedure and interpreted. The most important finding was the great criterion complexity for this group of physicians. This complexity suggests that one cannot adequately measure physician performance on the basis of a single score or a few scores. Instead, one must obtain a relatively large number of scores. Performance in both premedical and medical education was independent of performance as a physician.

R 12

26,174

Hammes, J.A. & Osborne, R.T. SURVIVAL RESEARCH IN GROUP ISOLATION STUDIES. *J. appl. Psychol.*, Dec. 1965, 49(6), 418-421. (University of Georgia, Athens, Ga.).

The development of a nationwide fallout shelter system has initiated research on the physiological, psychological, and sociological aspects of group isolation. The most austere occupancy tests have been conducted at the University of Georgia. 4 studies are briefly reported. Experimental Study I, a 4 day study, was the most austere. The shelterers subsisted on 315 calories per person per day and slept on a concrete floor. Experimental Studies II & III provided 3/16 in. thickness of corrugated fiberboard as floor covering and additional food and water. The age ranges were extended in these studies (7-67 years). Experimental Study IV was designed as a 1-week elementary school occupancy study. 4 adults accompanied 28 children. Space was reduced to 6 square ft per occupant. Results indicate that healthy men, women, and children can endure 2 weeks' isolated confinement under conditions of severe austerity without suffering deleterious physiological or psychological effects. The following specific conclusions were reached: a) 8 square ft per person, exclusive of storage, although uncomfortable, would appear to be adequate; b) under optimal temperature conditions, 1 quart per person per day of water is adequate for drinking purposes with the Nabisco wheat-flour biscuit and the Nebraska cracker; c) under optimal temperature conditions, 814 calories per person per day of OCO survival rations are adequate over a 2-week period. Sleeping conditions, sanitation and medical kits are also discussed. (HEIAS)

R 5

26,175

Maas, J.B. PATTERNED SCALED EXPECTATION INTERVIEW: RELIABILITY STUDIES ON A NEW TECHNIQUE. *J. appl. Psychol.*, Dec. 1965, 42(6), 431-433. (Cornell University, Ithaca, N.Y.).

A proposed interview procedure has ratings based on scaled examples of on-the-job behavior. Traits necessary were determined, and examples were written of behaviors related to these traits. Examples were checked for agreement as to trait category, and scaled as to degree of the trait exhibited. Interviewers rated each candidate by making analogies from the candidate's responses to job behavior that might be expected of the candidate. Interviews using 3 raters to judge 1 candidate simultaneously and using 2 different interviewers to judge the same candidate 1 at a time, indicate the technique's high reliability. Interrater reliability was significantly higher ( $p < .01$ ) using the scaled expectation rating method than when using a traditional adjective rating scale. (Sources of variance in interviews are specified).

R 4

26,176

Hollander, E.P. VALIDITY OF PEER NOMINATIONS IN PREDICTING A DISTANT PERFORMANCE CRITERION. *J. appl. Psychol.*, Dec. 1965, 42(6), 434-438. (New York State University, Buffalo, N.Y.).

This paper reports the follow-up phase of a study of peer nominations begun in 1955 at the Naval OCS in Newport, Rhode Island. Over 700 trainees completed several peer nomination forms at various stages of training, 1 in particular on "success as a future Naval Officer" (FO). Subsequently, 639 trainees were identified who had gone on to duty as officers for about 3 years. The average grade they secured on a key portion of the fitness report ratings assigned by their direct superior officers was used as a performance criterion; it had a split-half reliability of .90. In the prediction of this criterion, the FO peer nomination score from the 3rd week of training gave a validity of .40 which was as high as that for later FO scores and which was only slightly diminished after academic grades and popularity were partialled. The findings support the use of early peer nominations as a valid supplemental measure in predicting performance after training.

R 17

26,177

Malinovsky, M.R. & Barry, J.R. DETERMINANTS OF WORK ATTITUDES. *J. appl. Psychol.*, Dec. 1965, 42(6), 446-451. (Regional Rehabilitation Research Institute, University of Florida, Gainesville, Fla.).

The motivator-hygiene theory of work attitudes assumes 2 independent sets of variables (motivator and hygiene) important to employee job satisfaction and dissatisfaction. 1 set of variables (motivator) leads to high job satisfaction but does not contribute in any appreciable degree to dissatisfaction, while another set of variables (hygiene) leads to job dissatisfaction but contributes little to satisfaction. The purpose of this study was to examine the assumptions underlying the motivator-hygiene theory of work attitudes. The applicability of these assumptions to the job attitudes of 117 blue-collar workers was determined through factor analyses of a 40-item work attitude survey. The job attitudes of blue-collar workers could be separated into 2 relatively independent sets of variables, comparable to motivator or hygiene variables. However, both sets of variables were found to be positively related to job satisfaction, contrary to predictions from the theory.

R 16

26,178

Kirchner, W.K. RELATIONSHIPS BETWEEN GENERAL AND SPECIFIC ATTITUDES TOWARD WORK AND OBJECTIVE JOB PERFORMANCE FOR OUTDOOR ADVERTISING SALESMEN. *J. appl. Psychol.*, Dec. 1965, 42(6), 455-457. (Minnesota Mining & Manufacturing Company, St. Paul, Minn.).

Product-moment correlations were computed between and among 10 scales measuring general and specific work attitudes and 2 objective, numerical measures of sales performance for 72 outdoor advertising salesmen who completed a 100-item attitude questionnaire. The attitude questionnaire contained items related to the following areas of work: General attitude toward work, supervision, attitude toward company, compensation, chance for advancement, training, fellow employees, benefits, communications, working conditions. In addition, attitudes toward supervision were strongly related to general work attitudes and other work aspects, suggesting that the supervisor really did represent the company to these salesmen who were on highly isolated jobs. Of some interest was the general low relationship between attitudes toward compensation and benefits to other attitudes and to actual job performance.

R 7

26,179

Kay, E., Meyer, H.H. & French, J.R.P., Jr. EFFECTS OF THREAT IN A PERFORMANCE APPRAISAL INTERVIEW. *J. appl. Psychol.*, Oct. 1965, 42(5), 311-317. (General Electric Company, Ossining, N.Y.).

Real-life appraisal interviews conducted by 92 manager-subordinate pairs were studied intensively. Reactions of subordinates were systematically obtained before and after their appraisal interviews and the proceedings in the actual interviews were carefully documented by trained Os. Measures of subsequent performance improvement realized as a result of the appraisal interviews were taken 12 wks. later. The results indicated that a manager's attempts to assist a subordinate by pointing up improvement needs were likely to be perceived by the subordinate as threatening to his self-esteem and to result in defensive behavior. The greater the threat, the less favorable the attitude toward the appraisal system and the less the subsequent constructive improvement in job performance realized. These reactions were strong to the extent that the subordinate had relatively low occupational self-esteem. Some practical implications for appraisal practices are cited.

R 7

26,180

Buel, W.D. BIOGRAPHICAL DATA AND THE IDENTIFICATION OF CREATIVE RESEARCH PERSONNEL. *J. appl. Psychol.*, Oct. 1965, 42(5), 318-321. (Vernon Psychological Laboratory, Chicago, Ill.).

Biographical data items were weighted and cross-validated for the identification of creative research personnel. Significant linear, partial linear, multiple, and multiple-partial correlations are presented between no previous experience (NPE) and previous experience (PE) keys and a variety of creativity criteria. Reviewing the valid items, an image of the creative biological and physiological scientist emerges which is corroborative of previously reported images. The more creative men tend to have a positive self-image, a need for personal independence in work and social environs, wide interests, a history of parental permissiveness insofar as decision making is concerned, and a tendency to become overinvolved (in terms of time available to perform job-related activities). Further, they tend to react positively to challenge, seek unstructured work situations, and desire contemplative pursuits. Apparently, creative personnel in a variety of research areas (petroleum, organic, biological, and physiological) are describable and identifiable in similar terms.

R 11

26,181

Walker, R.E., Nicolay, R.C. & Stearns, C.R. COMPARATIVE ACCURACY OF RECOGNIZING AMERICAN AND INTERNATIONAL ROAD SIGNS. *J. appl. Psychol.*, Oct. 1965, 49(5), 322-325. (Loyola University, Chicago, Ill.).

This study investigated the hypothesis that symbol road signs (similar to the international signs) could be more accurately recognized than word road signs (typical of the American signs). The Ss used were 81 college undergraduates. The hypothesis was significantly supported under 2 conditions. Under 1 condition, both the symbols and signs were black; in the other, the symbols were black and red. A further phase of the study demonstrated the ease with which the symbol signs were learned. A simple memory test conducted 24 hrs. after the learning indicated perfect recall of the symbol signs and their meaning. The potential significance of the results and research possibilities were discussed. Several advantages of changing the American road-sign system from words to symbols are presented.

R 3

26,182

Coleman, E.B. LEARNING OF PROSE WRITTEN IN FOUR GRAMMATICAL TRANSFORMATIONS. *J. appl. Psychol.*, Oct. 1965, 49(5), 332-341. (New Mexico State University, University Park, N.M.).

4 comparisons of pairs of grammatical transformations are reported. Active-verb transformations were found easier to learn than their nominalizations ( $p < .001$ ), actives were easier to learn than their passives ( $p < .01$ ), nonembedded sentences were easier to learn than their embedded counterparts ( $p < .05$ ), and no significant difference was found between adjectivalizations and their counterparts using adjectives. 10 different categories of active-verb sentences and their nominalizations were examined and by determining which categories of nominalizations were responsible for deleterious effects, several rules for improving readability were reexpressed in terms of grammatical transformations. The data were also used to examine the extent to which complex sentences are recoded and stored in memory as kernels.

R 15

26,183

Slak, S. & Brozek, J. EFFECTS OF INTERMITTENT ILLUMINATION ON PERCEPTUAL-MOTOR PERFORMANCE. *J. appl. Psychol.*, Oct. 1965, 49(5), 345-347. (Wayne State University, Detroit, Mich. & Lehigh University, Bethlehem, Penn.).

The experiment was designed to determine whether under conditions of intermittent illumination there is a significant impairment in performance as measured by perceptual-motor tasks. Performance on 5 such tasks under 5 conditions of flickering light was compared with performance under steady light. The 5 flicker frequencies used were 1, 3, 9, 24, & 40 cps. All 5 tasks required vision and some degree of perceptual-motor coordination: inserting keys in a grooved pegboard, mirror tracing and 3 different types of card sorting. 44 Ss participated in the experiment. The Ss were divided into 6 groups: the control group with 14 Ss and 5 experimental groups with 6 Ss each. In a pretest, all Ss performed all 5 tasks under steady light. 2 weeks later, control Ss were again tested under steady light. The experimental Ss performed the tasks under 1 of 5 flicker frequencies. Time and error scores were considered. No gross detrimental effects of intermittent illumination were detected.

R 6

26,184

Poulton, E.C. LETTER DIFFERENTIATION AND RATE OF COMPREHENSION IN READING. *J. appl. Psychol.*, Oct. 1965, 49(5), 358-362. (Applied Psychology Research Unit, MRC, Cambridge, England).

375 adults were given 90 sec to read passages of about 450 words printed in 1 of 7 typefaces equated for size. They had then to answer 10 open-ended questions on the content. Of the typefaces without serifs Gill Medium, the letters of which were judged by typographical experts to be fairly strongly differentiated, was comprehended reliably faster than Grotesque 215 and 2 versions of Univers, in which the letters were judged to be less well differentiated ( $p < .05$ ). There were no reliable differences between the serif typefaces, Bembo an old style, Baskerville a transitional, and Modern Extended Number 1, nor between the serified and sans-serifed typefaces.

R 11

26,185

Hardin, E. PERCEIVED AND ACTUAL CHANGE IN JOB SATISFACTION. *J. appl. Psychol.*, Oct. 1965, 49(5), 363-367. (Labor & Industrial Relations School, Michigan State University, East Lansing, Mich.).

Analysis of identified questionnaire data collected from 196 office employees at the start and end of a 6-month period showed that change in overall job satisfaction as perceived at the end was a very poor, though statistically significant, proxy measure of change as computed from initial and terminal reports on levels of satisfaction. Perceived change in job satisfaction had zero regression on initial satisfaction but regressed very significantly on terminal satisfaction and on change in 14 job aspects as perceived at the end of the period. The findings cast serious doubts on the usefulness of the quasi-longitudinal design in studies of the impact of technological and organizational changes upon job satisfaction.

R 7

26,186

Trumbo, D., Ulrich, Lynn & Noble, M.E. VERBAL CODING AND DISPLAY CODING IN THE ACQUISITION AND RETENTION OF TRACKING SKILL. *J. appl. Psychol.*, Oct. 1965, 49(5), 368-375. (Kansas State University, Manhattan, Kan.).

120 Ss were trained on a pursuit tracking task with an irregular step-function input. Cues for coding the task were introduced via pretraining and rehearsal of a numerical code and by display overlays in a 2x2x3 design. 3 levels of specificity of cues were provided by the overlays with the most specific condition providing a numerical code like that of pretraining. The results showed that both pretraining and display coding facilitated early reduction of tracking error, but that neither these nor rehearsal of the numerical code affected retention performance after 1 wk. Taken together, these findings suggested that the verbal and display cues were used in the early coding of the task, but were less important later in practice and at retention.

R 11

26,187

Locke, E.A. THE RELATIONSHIP OF TASK SUCCESS TO TASK LIKING AND SATISFACTION. J. appl. Psychol., Oct. 1965, 49(5), 379-385. (American Institutes for Research, Washington, D.C.).

4 laboratory experiments are reported which examine the relationship between degree of task success and degree of liking for and satisfaction with the task. A number of different tasks, measures, and situations were used. In Exp. I the task was word unscrambling. Each of 85 Ss was given 1 set of 25 5-letter words, 1 set of 25 6-letter words, and 1 set of 25 7-letter words. The task in Exp. II involved listing objects or things that could be described by a given adjective (e.g., "heavy"); in Exp. III the task consisted of giving uses for objects (e.g., an ash tray); the task in Exp. IV was a standard pursuit-rotor task. For each experiment the Ss were divided into groups representing different "standards of success!" For example, in Exp. IV Ss were told to try and beat a constant standard of either 20 or 40 sec. on target on each 90-sec. trial. In all cases there was clear evidence for a significant (positive) linear relationship between success and measures of liking and satisfaction. The major reasons given for liking a task involved attributes of the individual's performance (e.g., improvement); reasons given for not liking a task most often involved attributes other than individual performance (e.g., the monotony of the task).

R 18

26,188

Naylor, J.C. & Briggs, G.E. TEAM-TRAINING EFFECTIVENESS UNDER VARIOUS CONDITIONS. J. appl. Psychol., Aug. 1965, 49(4), 223-220. (Ohio State University, Columbus, Ohio).

Transfer performance of 3-man teams was measured as a function of 2 system variables (task complexity and organization) and 1 training variable (skill level of a replacement for 1 of the team members) in a simulated radar controlled aerial intercept task. Each independent variable influenced team performance. Task complexity had a consistent effect across all transfer sessions with superior performance on the less complex task. Task organization influenced performance only after the replacement occurred with superior performance by teams organized to permit each S to work independently of (rather than interact with) his counterpart. The teams receiving a more highly trained replacement improved in performance immediately following; teams with a less skilled replacement actually deteriorated slightly but then recovered in a subsequent work period.

R 22

26,189

Wright, A.D., Frederickson, E.W. & Claflin, J.L. RADAR TARGET DETECTION AS A FUNCTION OF SEARCH AREA AND VIEWING DISTANCE. J. appl. Psychol., Aug. 1965, 49(4), 230-232. (USA Human Resources Research Office, Ft. Bliss, Tex.).

The detection task employed a 9 1/4 in. plan position indicator (PPI) and simulated targets. 30 Army trainees served as Ss. Each S performed the 9 combinations of viewing distance; a) 6 in.; b) 12 in.; c) 18 in.; and, search area; a) whole group; b) 1/4 scope; and c) 11/16-diameter circle within the whole scope. A Treatments X Treatments X Ss ANOVA indicated significant main and interaction effects: as viewing distance increases, detection performance is degraded; as search area increases, detection performance is degraded; optimum viewing distance when searching the whole scope is approximately 12 in., while optimum viewing distance for a small area (11/16 in. diameter) within a larger area is 6 in. or less.

R 5

26,190

Tallmadge, G.K., Jr. INCREASING PRODUCTIVITY IN PUBLIC WORKS MAINTENANCE: THE EFFECTS OF JOB ESTIMATES BASED ON ENGINEERED PERFORMANCE STANDARDS. J. appl. Psychol., Aug. 1965, 49(4), 233-236. (Planning Research Corporation, Los Angeles, Calif.).

Data regarding the size of conventional labor hour estimates, estimates based on Engineered Performance Standards (EPS), and labor hours expended in completing jobs were collected from a carefully selected sample of Navy Public Works offices. An analysis of 266 work orders sampled from 12 Navy activities revealed that EPS estimates were significantly lower than conventional estimates but that the difference diminished with time from between 35% to 40% early in the EPS program (1958) to between 5% to 7% in 1963. This reduction was attributed to a learning effect which caused a lowering of conventional estimates as they were shown to be excessively high. Other analyses showed that estimated hours were consumed on the job regardless of how grossly they appeared to overestimate actual requirements, indicating that EPS utilization increased productivity by an amount roughly corresponding to the initial difference between EPS and conventional estimates.

R 2

26,191

Evans, G.W. RISK-TAKING SET AND TARGET DETECTION PERFORMANCE. J. appl. Psychol., Aug. 1965, 49(4), 243-244. (USA Human Resources Research Office, Ft. Bliss, Tex.).

An experiment tested the hypothesis that an O's risk-taking set is related to his target-detection performance on a radar display. Ss were given an equal number of trials under neutral, risky, and cautious sets, where differential sets were produced by instructions. As hypothesized, when instructed to adopt a risky set, Ss made earlier detections of targets and had a higher false-positive identification rate than the same Ss when instructed to adopt a cautious set. These findings support the contention that radar detection performance can be regarded as a decision task.

R 2

26,192

Dennis, J.P. SOME EFFECTS OF VIBRATION UPON VISUAL PERFORMANCE. J. appl. Psychol., Aug. 1965, 49(4), 245-252. (College of Technology, Portsmouth, England).

Experiments have been carried out in which the effects upon visual performance of whole-body vibration have been compared with the effects of vibrating the visual object itself. At 6 cps, using similar angular displacements, vibration of the visual object was found to result in higher impairment of vision than vibration of the human S. At 14, 19, & 27 cps the converse was found to be the case; results which support previous theories of resonance of eyeball or facial tissue to account for the sensitivity of visual performance to whole-body vibration at these higher frequencies.

R 6

26,193  
Droege, R.C. & Crambert, A.C. FOLLOW-UP TECHNIQUES IN A LARGE-SCALE TEST VALIDATION STUDY. J. appl. Psychol., Aug. 1965, 49(4), 253-256. (US Employment Service, Washington, D.C.).

Records were kept on success of techniques used to obtain follow-up information on occupational and educational status of 12,615 individuals 2 yrs. after being tested in Grade 12. Various techniques were used, with varying degrees of success. The information was obtained for most individuals through use of letters, an effective and low-cost technique for obtaining factual information. It was found to be worthwhile to send as many as 3 letters, if necessary, before trying another technique. Among the most successful techniques, in terms of percentage of attempts that were successful, were telephone calls, personal visits, employment service records, and knowledge of individuals in the community.

R 3

26,194  
Murch, G.M. A SET OF CONDITIONS FOR A CONSISTENT RECOVERY OF A SUBLIMINAL STIMULUS. J. appl. Psychol., Aug. 1965, 49(4), 257-260. (Universitaet Goettingen, Goettingen, West Germany).

3 experimental groups of 10 Ss, each with their corresponding controls, were given mathematical problems in a tachistoscope as a supraliminal stimulus. At a level established by a pretest group, the experimental groups received subliminal answers to the problems. Group 1 attempted to solve the problems, Group 2 to guess at the answers, and Group 3 to select their answers from dual possibilities on a given list. A significant tendency was found in Groups 1 & 2 to repeat various subliminally projected digits in their answers, without the answers directly affecting their computational processes. Group 3 selected the projected answers significantly over the correct answers. The need for a positive relationship between supra- and subliminal stimuli as well as the relevancy of the task to the Ss' present activity was also observed.

R 2

26,195  
Makens, J.C. EFFECT OF BRAND PREFERENCE UPON CONSUMERS PERCEIVED TASTE OF TURKEY MEAT. J. appl. Psychol., Aug. 1965, 49(4), 261-263. (Michigan Technological University, Houghton, Mich.).

2 experiments are reported concerning a wider possible application for taste tests in brand research. In 1 experiment a panel of 150 compared the taste and texture of 2 identical samples of turkey meat. In the other, 61 Ss compared the taste and texture of unlike samples of turkey meat. In both experiments Ss were asked to match their comparisons with 2 related commercial brands. Results indicated that a well-known brand positively affected the taste which Ss experienced for samples of turkey meat.

R 8

26,196  
Preston, Caroline E. & Harris, S. PSYCHOLOGY OF DRIVERS IN TRAFFIC ACCIDENTS. J. appl. Psychol., Aug. 1965, 49(4), 284-288. (Psychiatry Dept., University of Washington Medical School, Seattle, Wash.).

50 automobile drivers whose driving involved them in accidents serious enough to require hospitalization were paired with 50 drivers without accident histories but matched according to sex, approximate age, race, and educational level. The Ss were compared on the basis of their driving experiences and performance on written tests. The accident victims differed from the comparison Ss in a higher incidence of previous traffic violations but were not distinguishable from the comparison Ss on any written tests. The accident Ss were similar to the "safe" drivers in describing themselves as much closer to "expert" than "very poor" on a driving performance continuum. In fixing the responsibility for the accidents and in estimating their driving competence at the time of the accidents, the accident Ss' reports are at considerable variance with police reports.

R 10

26,197  
Whiteman, I.R. THE ROLE OF COMPUTERS IN HANDLING AEROSPACE SYSTEMS HUMAN FACTORS TASK DATA. FINAL REPORT, 3 JUNE 1964-3 JUNE 1965. Contract AF 33(615) 1557, Proj. 1710, Task 171006, AMRL TR 65 206, Dec. 1965, 182pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Computer Concepts, Incorporated, Los Angeles, Calif.).

The characteristics of a computer based data system for handling human factors task information generated in support of advanced system development are described. On the basis of information gathered from users and generators of data at representative Government and contractor installations, the current and potential uses of computers were assessed to determine the desirable characteristics for a computerized human factors task data handling system. The proposed data handling system will assist the human factors specialist and system design engineers in the design and development of systems by providing them with means for: a) drawing them closer to the data through a user-oriented system; b) comparing data generated throughout the life-cycle of an advanced system and across systems; c) analyzing data and conducting man-machine simulations; and d) insuring that data are made available on a selective query and a timely basis. These objectives are met within the framework of a data system concept referred to as CENTRAL. The functions of CENTRAL are: a) data storage and retrieval; b) data processing; c) computer program maintenance; and d) system operational manual maintenance. The forms of data to be housed within CENTRAL, the methods for storage, processing and retrieval, and the nature and configuration of the data handling are discussed. Recommendations are made for a follow-on prototype data handling system to be developed and exercised with actual advanced system data. The prototype system would be responsive to data which are best stored within the computer, and data which do not lend themselves to storage within a digital computer, such as data of a pictorial nature.

R 194

26,198  
Gillespie, K.W. COMPARATIVE EVALUATION OF USAF STANDARD A/P22S-2 AND IMPROVED A/P22S-2A HIGH ALTITUDE, FULL PRESSURE FLYING OUTFITS. Proj. ESP 913A 0000 97090, SEG TR 65 9, April 1965, 62pp. USAF Systems Engineering Group, Wright-Patterson AFB, Ohio. (AD 467823)

In this report, the A/P22S-2A is compared with the A/P22S-2 outfit. The components and factors compared included: the visor, weight, leak rate and pressure relief, reach capability, work space, thermal and acoustical evaluation, back pressure, and altitude. The comments of the persons wearing the outfit were also considered. Results indicate that the A/P22S-2A shows some improvement over the A/P22S-2; however further improvements are required to make the outfit more operationally acceptable. Specific recommendations are made as to those areas that need improvements. In addition to the 25 specific recommendations this section also included 2 appendices: Appendix I- Evaluation of Heated Visor; Appendix II- Optical Test of Visor.

R 4

26,199

Deyneko, V.F. EFFECT OF ENLARGEMENT OF A PHOTOGRAPHIC IMAGE ON SOME MEASURING PROPERTIES OF AERIAL PHOTOGRAPHS. ERDL T 1774 65, Feb. 1965, 10pp. USA Engineer Research & Development Labs., Fort Belvoir, Va. (Transl: Geodeziya i Kartografiya, 1964, 5, 42-48). (AD 611333)

An aerial photograph enlarged to the scale 1:M and obtained from an aerial negative taken from a great height, in many respects has better measuring properties than does a contact print from an aerial negative taken directly in the scale 1:M from a lower height. It is more feasible for the contour and composite surveys to conduct the photographing from as great a height as possible, taking into account the maximum enlargement ratio at which a satisfactory quality of the aerial negatives may be obtained. At present, it is quite possible to conduct aerial photographing to large and medium scales of surveying, figuring on a subsequent magnification of the aerial photographs by 4-8 times. In addition, in many cases, the already available aerial negatives from prior surveys with an enlargement of the photo-image by 3-4 times, can be successfully utilized. The use in production of high enlargement ratios for a photo-image will permit us to raise appreciably the output and economy of the aerial photogeodetic operations in contour and composite surveying without a decrease in the accuracy of the maps and charts. (HEIAS)

26,200

Goldman, R.F. THE ARCTIC SOLDIER: POSSIBLE RESEARCH SOLUTIONS FOR HIS PROTECTION. ca. March 1965, 22pp. USA Research Institute of Environmental Medicine, Natick, Mass. (AD 613189)

The current goal for cold weather clothing systems, as stated in the required military characteristics, is 8 hours tolerance while inactive at  $-40^{\circ}\text{F}$  when there is a 3 mph wind. This requirement has yet to be met. This level of protection is easily provided for all but 5 or 10% of the total body. The well recognized geometrical relationships of small cylinders prohibits adequate practical insulation for the fingers and toes at an ambient temperature of even  $-20^{\circ}\text{F}$  using the best available insulating materials. The research reported here was conducted over a 1-year period in 5 arctic chamber study phases; the first 4 at  $-40^{\circ}\text{F}$  with a 10 mph wind and the fifth at  $65^{\circ}\text{F}$ . 3 to 5 Ss were studied in each phase. The Ss spent the majority of the chamber exposure periods (up to 7 hours) seated. The results of the study indicate that it appears most practical to supply auxiliary heat directly to the extremity surface. While different thermal lagging of areas of the hand with differing mass to surface-areas (such as the fifth finger and the thumb web) makes maintenance of a uniform extremity temperature difficult and produces problems as noted during the initial cooling with the  $68^{\circ}\text{F}$  thermostat settings, it is sufficient to maintain the "weakest link," the fifth finger tip, at  $60^{\circ}\text{F}$ . This choice corresponds with the lowest hand skin temperature for unaffected manual performance in the cold. Additionally, very little extra tolerance time was found in the present study when  $80^{\circ}\text{F}$  rather than  $60^{\circ}\text{F}$  was selected. While more power capacity is required to rewarm a cooled extremity than to maintain a given temperature with continuous heat, thermostating is well worthwhile.

R 21

26,201

Albert, P.A. COLD TEST EVALUATION OF SOME COMPONENTS OF THE NASA MERCURY SURVIVAL KIT. Proj. 8238, Task 823802, AAL TDR 64 24, Feb. 1965, 18pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (AD 462624)

Components of Project Mercury Survival Equipment were subjected to evaluation tests to determine their operational adequacy under low environmental temperatures. In-house comparative testing was performed on the NASA and the standard MB-4 1-man life rafts, to determine which raft provided greater protection against heat loss from S to surroundings. Instrumented Ss, with and without air pillow for buttock insulation, were seated in the rafts in water at  $2.0^{\circ}\text{C}$  and ambient air temperatures of  $0^{\circ}$  and  $-18^{\circ}\text{C}$ , for 2-hour periods. Thermal variations were assayed by measuring rectal and selected skin temperatures. The raft and other components, such as the NASA life vest, strobe light, transceiver and water container, were also cold-soaked at  $-30^{\circ}\text{C}$ , to determine structural integrity and certain operational characteristics, both during the exposure and after rewarming to a more temperate state. Results obtained indicate that the NASA raft and, under certain conditions, possibly the water container are superior to current Air Force items for survival in cold environments. Also, the inclusion of an air pillow for buttocks insulation as a part of the raft assembly was indicated. Means for improving the global capability of the survival kit are suggested.

26,202

Dawson, W.W. & Wiederwohl, H. FUNCTIONAL ALTERATION OF VISUAL RECEPTOR UNITS AND RETINAL PIGMENTS BY X-IRRADIATION. Radiation Res., Feb. 1965, 24(2), 292-304. (USA Medical Research Lab., Psychology Div., Fort Knox, Ky.). (Reprint)

Single functional visual receptor units from the compound eyes of 40 *Limulus polyphemus* were examined for visible light and X-ray "phosphene" responses similar to those previously reported in electroretinogram studies of the whole vertebrate retina. Doses of X-rays many times those required to produce the ERG "phosphenes" or retinal surface potentials were ineffective in reducing the level of dark adaptation. However, reduced light response latency and reduced light threshold were consistently observed during X-ray exposure. Extracts and suspensions of retinal material prepared from the eyes of frogs (*Rana catesbeiana*) were examined spectrophotometrically, during and after irradiation. No wavelength shifts of the peak optical density were seen that might indicate the alteration of the extracts or formation of photoproducts during irradiation. Increases in density consistently followed X-ray exposures of magnitudes up to 500,000 times as great as the ERG "X-ray phosphene" threshold.

R 21

26,203

Biernson, G. & Snyder, A. A THEORETICAL MODEL FOR COLOR VISION. FINAL REPORT MAY 1963-APRIL 1965. Contract AF 33 (657) 11717, Proj. 7232, Task 723205, AMRL TR 65 193, Dec. 1965, 227pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Sylvania Electronics Systems, Waltham, Mass.).

This report covers the development of a model of color vision based on feedback control principles, which provides an explanation for the wide dynamic range, high accuracy of spectral discrimination, and invariance to changing illumination that we experience in color vision. The model is consistent with physiological and psychological evidence. The interpretation of the recent spectrophotometer measurements on individual cones in the retina, is seriously called into question in this report. It has been assumed that these experiments have verified the trichromatic theory of Thomas Young, however, the evidence is weak. A basic deficiency of this evidence supporting the Young theory is that the color-vision model that results is incomplete. In addition, the conclusion that the eye has 3 types of cones is not substantiated by microscopic examination of the cones, nor by measurements on the cone material in solution. In this report a spectral scanning theory is proposed. Analysis is presented of waveguide modes in the retinal receptors which are assumed to be the means of spectral discrimination. The study shows that there are 3 primary modes in the visible range. These 3 modes are shown to be capable of producing the effects attributed to different photopigments in the spectrophotometer measurements, and to be capable of providing color signals with the spectral responses measured on human color vision.

R 81

26,204

Izzo, L.L. & Cubberly, H.A. OPTICAL SPOT SIZE STUDY FOR DATA EXTRACTION FROM A TRANSPARENCY. FINAL REPORT FEBRUARY 1965-JULY 1965. Contract AF 33 (615) 2355, Proj. 6114, Task 611410, AMRL TR 65 175, Sept. 1965, 70pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (CBS Labs., Columbia Broadcasting System, Inc., Stamford, Conn.).

A breadboard model scanner using coherent light to generate a small optical spot for data extraction from a transparency was constructed. Using the technique developed, a capability of distinguishing 256 lp/mm and 30 shades of grey light to dark was demonstrated. The system consists of a laser light source, a beam expander, a beam normalizer, a rotating optical scanning system to cover a 2 inch wide transparency, a transparency holder, a light collector and a photomultiplier assembly including video amplifier and high voltage power supply. These system components are basically "off-the-shelf" items.

26,205

Weltman, G., Christianson, R.A. & Egstrom, G.H. A DIVER RESTRAINT DEVICE FOR UNDERWATER EXPERIMENTATION. Biotechnology Lab. Tech. Note 30, Rep. 65 5, Feb. 1965, 6pp. Engineering Dept., University of California, Los Angeles, Calif.

This report describes the design and use of a diver restraint device. Initial use of the restraint device has been in conjunction with an ongoing study of the visual fields available to the SCUBA diver through various commercial faceplates. The restraint device is also undergoing modifications to transform it into a force platform and underwater ergometer. With this arrangement it will be possible to measure the horizontal thrust produced under different conditions of underwater propulsion: kicking with and without fins, for example, or using a foot-operated propellor. It is also planned to use the instrumental device as an ergometer in examining the metabolic output associated with various levels of underwater work. In addition to the above specialized applications, the device can be used as a test station in general examinations of underwater physiological instrumentation, and for subject support and orientation during investigations of the overall physiologic responses to diving.

26,206

Milan, F.A. PROJECT COLD CASE. Proj. 8238, Task 823801, AAL TDR 64 23, Feb. 1965, 26pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (AD 462767)

The results of Project Cold Case, an investigation of the cold land survival capabilities of Air Force pilots wearing the Full Pressure High Altitude Flying Outfit (A/P22S-2 & A/P 22S-3) are presented in this report. 6 Ss wearing these garments were placed under simulated survival conditions in a wooded area of interior Alaska near Fairbanks. Ambient air temperatures reached -30°F and were below -27°F for at least 50% of the time. On the third day air temperatures rose and remained at -10°F until the conclusion of the test. The test lasted for 72 hours. 2 Ss wearing the Full Pressure Suit without additional clothing survived for 11 & 30 hours. At the end of this time they were fatigued and moderately hypothermic. 2 Ss with the Full Pressure Suit plus a 9-piece down-filled survival outfit (Clothing Outfit, arctic survival) survived for 52 & 72 hours. The 52-hour survivor suffered a noncold injury which necessitated his removal. 2 Ss with the Full Pressure Suit plus an experimental ADC Walk-Around Sleeping Bag survived for 72 hours each.

26,207

Simons, J.C., Walk, D.E. & Sears, C.W. MOBILITY OF PRESSURE-SUITED SUBJECTS UNDER WEIGHTLESS AND LUNAR GRAVITY CONDITIONS. FINAL REPORT JUNE 1961-JUNE 1962. Proj. 7184, Task 718405 & 718408, AMRL TR 65 65, Aug. 1965, 95pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Problems of moving through hatchways under zero and lunar gravity conditions, and related design problems of hatch size and shape, were investigated in flight. Ss were timed and photographed as they accomplished various motions during weightless and lunar-gravity maneuvers of a large cabin aircraft. Performance data are presented for various combinations of clothing, gravity and body-position conditions. Time and contact data are presented for the egress motion as it is influenced by changes in the exit area. Orientation problems and maneuvering techniques, as influenced by area and volume restrictions, are discussed. Motions of pressure-suited Ss generally required 30% more time than corresponding motions of unsuited Ss. Most motions required 35% more time during zero G than during lunar G. No significant differences in egress times were found among 4 body-positions. Compared with 1 in. of exit clearance, 5 in. of clearance improved egress time by approximately 6%. Accuracy, rather than time of motion, appeared to be a more sensitive measure of operator performance for the egress task. A 95th percentile shoulder plane with a 19.4 in. major axis is proposed as a basic egress reference.

R 20

26,208

Smith, K.J., Speckmann, E.W., George, Marilyn E., Homer, G.M., et al. BIOCHEMICAL AND PHYSIOLOGICAL EVALUATION OF HUMAN SUBJECTS WEARING PRESSURE SUITS UNDER SIMULATED AEROSPACE CONDITIONS. FINAL REPORT AUGUST 1963-JUNE 1966. Proj. 7164, Task 716405, AMRL TR 65 147, Oct. 1965, 49pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio

A series of experiments has been designed to determine the water, energy, and protein requirements of man under various simulated aerospace conditions. The experiment described measured the effects of wearing a MA-10 pressure suit continuously for 14 days on the aforementioned measurements. A freshly prepared diet that closely matched proposed aerospace diets was fed to 4 human volunteers and coefficients of apparent digestibility and balances of the component nutrients were determined. The results showed that the wearing of unpressurized MA-10 suits under ambient conditions for 14 days did not affect the Ss' fluid intake and output. No significant changes were observed in digestibilities or balances of the nutrient components. Results indicated that the fresh food diet was very efficiently utilized. No significant changes in S blood pressures, oral temperatures or pulse rates were observed during the experiment. All hematological and chemical analyses of blood were within the normal range and did not exhibit differences between experimental periods. The 2 day menu of fresh foods proved to be very acceptable and did not decrease in acceptability during the 42 day experiment.

R 29



26,209

LaFavers, E.V. & Mason, C.C. INTERFACE TESTS FOR EVALUATING ABILITY OF PRESSURE-SUITED SUBJECTS TO PERFORM LUNAR SCIENTIFIC TASKS. NASA TM X 1170, Nov. 1965, 28pp. National Aeronautics & Space Administration, Washington, D.C. (Manned Spacecraft Center, NASA, Houston, Tex.).

NASA Manned Spacecraft Center conducted mobility studies with Ss wearing an Apollo developmental space suit pressurized to 3.7 psig near Bend, Oregon, on August 24 to 28, 1964. Activities were performed to determine time and ability for climbing and traversing, and for performing scientific experiments. Velocity for climbing and traversing varied from 0.06 mi per hour for climbing a 30° extremely rough-surfaced slope to 2.84 mi per hour for walking on an ideal surface. Ss were able to perform the entire range of scientific tasks as long as the task did not require delicate manipulation on a surface at the level of the S's feet. Only the simpler tasks could be performed at this level. Improvement in both exploration techniques and suit design is therefore required in order to assure that all scientific tasks may be performed.

26,210

Veghte, J.H. EFFICACY OF PRESSURE SUIT COOLING SYSTEMS IN HOT ENVIRONMENTS. Aerospace Med., Oct. 1965, 36(10), 964-967. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

3 different air distributing systems and one water-cooled system were evaluated for efficacy in cooling a person in a full pressure suit. 5 Ss participated in experiments at atmospheric pressure in a 43C environment. The pressure suit was worn unpressurized and pressurized at 192 mm Hg. The results show the separate tubular air ventilating garment to be equal to or superior in evaporative cooling efficiency to either an extremity distributing system which is an integral part of the current operational full pressure suit, or to the standard Air Force ventilating garment. The water-cooled system was superior to all air distribution systems and the Ss were comfortable for the entire 2-hour test period. In control experiments with no ventilation, tolerance limits were reached before the end of 2 hours. On the basis of these data, serious consideration of water-cooled suit systems for maintaining a person in thermal comfort under conditions of thermal stress should be continued.

R 8

26,211

Fellig, P. OXYGEN TOXICITY: ULTRASTRUCTURAL AND METABOLIC ASPECTS. Aerospace Med., July 1965, 36(7), 658-662. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Evidence is reviewed indicating that exposure of rats to O<sub>2</sub> at 760 mm. Hg and at 258 mm. Hg results in subcellular hepatic and renal alterations, in the absence of pulmonary histopathology. Mitochondrial changes including enlargement, clumping and increased numbers of cytolosomes containing degenerating membranes constitute the striking findings. Thyroid overactivity is excluded as the basis for these changes inasmuch as protein-bound iodine is reduced (at 760 mm. Hg) or remains the same (at 259 mm. Hg). The possibility that alterations in the redox state of pyridine nucleotides may be the responsible toxic cellular mechanism is suggested by the protective action of sodium lactate and by in vitro studies on agents inducing mitochondrial swelling.

R 25

26,212

Richardson, D.L. STUDY AND DEVELOPMENT OF MATERIALS AND TECHNIQUES FOR PASSIVE THERMAL CONTROL OF FLEXIBLE EXTRAVEHICULAR SPACE GARMENTS. FINAL REPORT JULY 1964-JUNE 1965. Contract 33(615) 1904, Proj. 6373, Task 637302, AMRL TR 65 156, Sept. 1965, 82pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Arthur D. Little, Inc., Cambridge, Mass.).

This program encompassed an analytical and experimental investigation of the application of passive thermal control techniques to extravehicular flexible space garments in 300 nautical mi earth orbits. Results indicate that passive thermal control by varying the absorptance and emittance of the outer surface of the garment is not possible when internal heat generated is in excess of 1500 Btu/hr. For all conditions, the suit's solar absorptance should be as small as possible and its emittance as large as possible. By controlling the conductance of the space suit wall, internal heating rates to 2000 Btu/hr are achievable when the space suit has an absorptance of 0.17 and an emittance of 0.85. A solar parasol with selected radiating properties on each side allows for higher internal heating rates. Experiments were made in a simulated noon orbit with a cylindrical section of a space suit which was 1st tested with an evacuated insulation and then with a helium-fillable insulation. The range of average conductance for these insulations was 0.3 to 4.0 Btu/sq ft hr °F. A range of internal heat generation from 600 to 2100 Btu/hr was achieved when the evacuated insulation was filled with helium.

R 19

26,213

Bushey, T.J. HAND SIZE II. VOLUNTARY OPENING WITH SINGLE POSITION STOP. FINAL REPORT. Proj. 3A014501A71E 03, Tech. Rep. 6501, Jan. 1965, 9pp. USA Medical Biomechanical Research Lab., Walter Reed Army Medical Center, Washington, D.C. (AD 462409)

The design, development and evaluation of a voluntary opening hand mechanism with a single position stop for Hand Size No. II, is described. The purpose of the development of this hand prosthesis has been to design a realistic looking hand which furnishes, to a limited extent, the basic prehension function of the amputated or congenitally missing member. The mechanism described in this report employs a system of levers to force the fingers to open and springs to supply the prehension force at the finger tips. By operating the hand mechanism against the force of the springs the 1st and 2nd fingers are pivoted away from the thumb. When the force on the operating mechanism is released and the fingers are returned to the rest position by force of the springs the amputee is provided with a three-jaw clutch-type grasp which enables him to hold objects of almost any shape. This mechanism also provides the user with a back-lock in the closed position which allows the amputee to pick up and hold thin elongated objects, or to carry heavy handled objects, such as suitcases, briefcases, etc. without maintaining a continued force to hold the fingers in the closed position.

26,214

Rowland, G.E. FEASIBILITY STUDY OF CAMOUFLAGE FOR TENTS. FINAL TECHNICAL REPORT 29 APRIL-29 DECEMBER 1965. Contract DA44 009 AMC 1085(T), Task IM624-101 D46701, R&C Rep. 65 11 101, Dec. 1965, 123pp. USA Engineering Research & Development Labs., Fort Belvoir, Va. (Rowland & Company, Inc., Haddonfield, N.J.).

The objective was to outline a wide variety of unique and potentially effective new ideas for consideration as solutions to problems associated with camouflage of tents and air supported structures. 23 different concepts are described and illustrated under 3 classifications: a) concepts for adding minor changes to existing shelters; b) concepts for erecting camouflage devices over existing shelter designs; and c) concepts for creating camouflage out of ingredients either at the local site or in specialized factories. Recommendations are made for carrying the more promising ideas to a model stage for tentative evaluation in laboratory and field research studies on existing shelters. Further suggestions are made for development of shelter-camouflage systems as total systems, i.e. as integrated designs encompassing all required features of both the camouflage and the shelter in the original product so that subsequent usage by the troops will automatically result in well camouflaged shelters with little or no additional effort over that required to erect the shelter itself.

R 31

26,215

National Aeronautics & Space Administration & US Federal Aviation Agency. BALLISTOCARDIOGRAPHY. A BIBLIOGRAPHY. NASA SP 7021 (FAA AM 65 15), Sept. 1965, 46pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C. & US Federal Aviation Agency, Washington, D.C.

This bibliography is a compilation of references to papers, reports, monographs, reviews, and books, of both domestic and foreign origin, which appeared during the period 1877-1964. Ballistocardiography is a technique for producing a graphical representation of repetitive motions of the human body arising from the sudden ejection of blood into the great vessels with each heart beat. Standard techniques are emphasized in the references, but attention is also given to several related methods that are used to record these phenomena and to the equipment and instrumentation employed in such investigations. The citations are arranged alphabetically.

R 700

26,216

Institute of Environmental Sciences. FACILITY SURVEY. Dec. 1965, 244pp. Institute of Environmental Sciences, Mt. Prospect, Ill.

This facility survey includes 3 sections: Section I presents equipment groupings for the following environments: Acceleration, Acoustics, Altitude, Altitude/Temperature, Altitude/Temperature/Humidity, Dynamics, Electrical R.F.I., Explosion, Fungus, Humidity, Shock, Space Simulation, Solar, Temperature, Temperature/Vibration, Vibration, and a section on Human Factors. The index code number of the participating company and a brief description of the facility is included. Section II represents the full report as submitted by each participant, and includes the name of the cognizant company representative. The companies are not listed alphabetically. A geographical listing of the participating companies appears under Section III.

26,217

USN Aeronautical Instruments Laboratory. INTEGRATED COCKPIT INSTRUMENTATION SYSTEM STUDY FOR P3B 'VP A-NEW' WEAPON SYSTEM AIRCRAFT COCKPIT OPERATION ANALYSIS (U). INTERIM REPORT. Proj. WepTask RAV09J011/2021+F012 04 04, Problem Assign. 18A, Rep. NADC AI 6518, March 1965, 38pp. USN Aeronautical Instruments Lab., NADC, Johnsville, Penn. (AD 612918)

An analysis was made of the flight crew responsibilities and duties required in the P3/A-NEW weapon system mission. Each crew member was considered. Responsibilities for parameter monitoring and control manipulation were allocated and recommendations were made to correlate these allocations with anthropological data to obtain optimum locations for displays and controls.

R 6

26,218

Massachusetts Institute of Technology. FINAL REPORT TO VOCATIONAL REHABILITATION ADMINISTRATION, DEPARTMENT OF HEALTH, EDUCATION AND WELFARE, WASHINGTON, D.C. 1 SEPTEMBER 1964 THROUGH 30 SEPTEMBER 1965. Contract SAV 1036 65, Oct. 1965, 115pp. Sensory Aids Evaluation & Development Center, Massachusetts Institute of Technology, Cambridge, Mass.

More than a score of collapsible (telescoping or folding) canes were subjected to engineering and human analyses. A basic list of performance and design criteria was established. When it became apparent that no existing prototype met all the design criteria, the Center started to develop its own prototypes. Models which met all design criteria were: a) the aluminum-titanium tube, swaged-joint, dacron sheath, elastic shock cord cane; b) the aluminum-titanium tube, swaged-joint, central steel cable cane. In the high-speed embosser project, emphasis was placed on engineering reliability for production and applications. Special electronics were designed and fabricated to permit modification of Braille electronics for a wider variety of inputs. At the end of the 1st yr., nearly all the reliability problems had been solved. Of the 4 instruments selected as potential straight course indicators, only 1 (the National Research Council of Canada Radio Compass Straight Line Indicator) merited extensive evaluation by blind travelers. Recommendations were made to the developer of this instrument for modifications which probably will result in a useful device. A selected list of vocational and educational aids was given engineering and human performance analyses. To convert compositor's tapes to Grade II Braille, our original plan was to complete 2 existing computer programs (monotype to Braille translation and teletypesetter to Braille translation). However, it became apparent that a more versatile system (DOTSYS) could be designed. DOTSYS facilitates a greater variety of inputs (including monotype and teletypesetter tapes), the use of many computers (besides the 709 & 7094) as a central processor, and provides flexibility when connected to diversified outputs (punched cards, punched paper tape, magnetic tape, line printer-embosser, speech generator, etc.).

R 16

26,219

Hanff, G.E., Moulton, R.H. & Geller, R. PERSONAL PROPULSION SYSTEM. FINAL REPORT JUNE 1964-DECEMBER 1964. Contract AF 33(615) 1903, Proj. 7184, Task 718405, AMRL TR 65 89, July 1965, 24pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

This report describes a laboratory model of a simple manually controlled, tractor type, personnel propulsion unit for use under zero gravity conditions. The device consists of a pair of hand-mounted thrust nozzles with fore and aft thrust vector control. A backpack containing 2, high pressure, gas bottles supplies dry nitrogen to the thrusters. In the final configuration the only functional items which had to be specially developed were the hand control valve and the associated fingertip lever system. The valve selected was a balanced poppet design which would give the low torque values required for fingertip control as well as low pressure drop and satisfactory modulation characteristics. A series of tests were conducted to obtain thrust nozzle calibration, valve/nozzle modulation, and verification of the total system to deliver the required thrust. The tests verified that the thrust nozzles were within tolerance. The valve/nozzle combination demonstrated total system performance within specification requirements and with satisfactory modulation characteristics. Further research should include evaluation of the propulsion system in a zero gravity environment.

26,220

Rowland, G.E. & Yoos, H.F. TACTICAL PACKAGING CONCEPTS FOR SMALL ARMS AMMUNITION (SUMMARY OF AN EXPLORATORY STUDY). Contract DA 36 034 ORD 3670A, OMS Code 5522.11.553306.02, SHUFA 1920, R&C Rep. 65 29 3, March 1965, 13pp. USA Frankford Arsenal, Small Arms Ammunition Div., Philadelphia, Penn. (Rowland & Company, Inc., Haddonfield, N.J.).

This is the Final Report in a series of reports concerning the conceptual development of new practices in the packaging of small arms ammunition. The contractor has suggested seemingly feasible and imaginative utilization of materials (plastics, paper, etc.) which are fabricated by processes (extrusion, molding, folding, etc) and sealed and bound by techniques (plastic bands, immersion coating, etc.) which are novel to army practice, though in some instances, not to other fields of packaging. This report presents 4 additional concepts for packaging 2 particular developmental ammunition magazines: a) Upsy-Daisy Concept; b) Match Box Concept; c) Flip-top Concept; d) Hourglass Concept. Only minor discussion is given since earlier reports in the series included comprehensive coverage of the relevant issues.

R 3

26,221

Volkman, J. & Corbin, H.H. FURTHER EXPERIMENTS ON THE RANGE OF VISUAL SEARCH. FINAL REPORT. Contract AF 19(628) 2443, Proj. 7682, Task 768204, ESD TDR 65 169, Jan. 1965, 101pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Mt. Holyoke College, South Hadley, Mass.).

6 experiments on visual search are described. 2 essential terms, critical number and basal time, are defined: median latency of search plotted as a function of N matrix elements--at low N, latency is nearly constant--this is basal time; at the transition to longer latencies the N matrix elements is the critical number. Exp. I found that critical number varies with density of the stimulus matrix, but the area corresponding to critical number, i.e., the area of fast search is apparently constant for low densities and decreases considerably with high. Basal time is constant. Exp. II checked I and found the area of fast search to be ovaloid with the longer axis horizontal. Exp. III tried a more economical method for mapping out this area using a single line of elements tilted at various angles. Exp. IV used the method of brief exposures to examine the expansion of this area with increasing exposure time. Exps. V & VI dealt with methods of subdividing matrices and its relation to speed and reliability of successive search. (HEIAS)

R 5

26,222

Bassett, R.C., Kahn, M.H., LaMay, Moira, Levy, J., et al. HUMAN FACTORS RESEARCH IN 3-D DATA PRESENTATION. FINAL REPORT. Contract AF 19(628) 274, ESD TR 65 462, June 1965, 65pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (ITT Federal Laboratories, Nutley, N.J.).

A series of experiments was performed to evaluate some of the operating characteristics and potential utility of a volumetric (i.e., real) 3-dimensional display produced by projection of a CRT image onto a rotating translucent screen. Some of the variables tested were perceptibility of relative location of point targets in close proximity, perception of location of point targets relative to display boundaries and perception of absolute and relative motion of targets in the volume. Estimation of location and motion were found to be highly accurate and quite rapid. While the results do not point conclusively to specific applications, the utility of volumetric 3-D in making fine position and motion discriminations has been demonstrated. Further study would be required to ascertain utility in practical situations such as air traffic control, space surveillance, etc.

R 3

26,223

Gruber, A., Dunlap, J.W., DeNittis, G., Sanders, J.L., et al. DEVELOPMENT OF A METHODOLOGY FOR MEASURING INFANTRY PERFORMANCE IN RIFLE FIRING AND RELOADING. PHASE II. Contract DA 19 129 QM 2068, USATECOM Proj. 8 3 7700 01, June 1965, 55pp. USA General Equipment Test Activity, Fort Lee, Va. (Dunlap & Associates, Inc., Darien, Conn.).

A 3-phase research effort is underway to develop field methodology for measuring the effects of experimental clothing and equipment on the combat effectiveness of individual infantrymen. This report covers a portion of the work performed under Contract DA 19 129 QM 2068 (01 6141) by Dunlap & Associates, Inc., and is the second of a series of 7 reports presenting the results of Phase II of the study. Previous work under this project identified and ranked the relative importance of the physical tasks performed in combat by the individual infantryman. 2 of the tasks which were considered by a sample of combat veterans to be the most important to combat success were firing and reloading of the individual weapon. This report describes the work performed to develop a reliable method for measuring soldier performance in the essential ingredients of these tasks under conditions considered representative of combat conditions. A proposed method was tested using a modified Train Fire Range. Trials on the temporary facility demonstrated that the proposed system was sensitive to performance differences resulting from personal equipment worn, such as gloves and gas masks. A refined system is recommended for inclusion in a field course for evaluation in Phase III of the project.

R 1

26,224

Fetterman, D.E., Jr. SIMPLE SCALE INTERPOLATOR FACILITATES READING OF GRAPHS. Brief 65 10070, March 1965, 2pp. National Aeronautics & Space Administration, Washington, D.C.

This brief describes a simple device which facilitates accurate and rapid reading of the coordinates of points on graphs plotted on relatively coarse rectangular grids. It employs a transparent overlay with an interpolation scale which consists of an inscribed set of convergent straight lines with the segments at the triangular base of the scale of equal or different proportions depending on the type of coordinate system being read. (HEIAS)

26,225

Weir, W.R. DESIGN AND DEVELOPMENT OF AN ARTICULATED ARMOR GARMENT. FINAL REPORT. Contract DA19 129 QM 1809, Proj. 7 80 05 001, Tech. Rep. TS 130, March 1965, 103pp. USA Natick Labs., Natick, Mass. (Illinois Institute of Technology Research Institute, Chicago, Ill.). (AD 465119)

The problem of providing ballistic protection for the torso of the combat infantryman using rigid materials was studied to establish design criteria for the development of an articulated armored vest. Areas of study included the following: a) The body surface displacements which occur at the torso (i.e., thorax and abdominal regions) and the shoulder complex as a result of extreme movements of the arms and the torso; b) Dimensional relationships between large, medium, and small test Ss which could be interpreted as sizing criteria for garment design; c) Mechanical and physical problems related to the design and construction of an articulating armor garment. Efficient methods of anthropometric measurement were developed and implemented and the relationship between small, medium, and large test S anthropometry is established for single S samples. An optimum articulating armored vest was developed and built in prototype form. Data and discussion of the body studies as well as a complete description of the developed vest and its features of construction are included herein. Recommendations generated from this program are presented at the conclusion of this report.

26,226

Guy B. Panero, Incorporated. SUMMER VENTILATION TESTS ABOVE GROUND FALLOUT SHELTER. Contract OCD PS 64 201, Subcontract B 64212 US, Subtask 1214 B, April 1965, 57pp. Guy B. Panero Incorporated, New York, N.Y.

7 natural ventilation tests were conducted in a shelter located in the central core of the 17th floor of a 70-story, 1930 vintage building in New York, N.Y. Modes of ventilation tested include: zero ventilation under closed shelter conditions, cross ventilation via open windows and doors, updraft ventilation using an airshaft. Shelter occupancy was simulated and pertinent temperature, psychrometric, electrical, and wind data were recorded hourly. Evaluation of the results suggests: this shelter should be considered as adiabatic during summer months, for purposes of calculating heat dissipation rates; because of low rate of heat transfer, temperature will rise rapidly above 85°F if closed shelter operation is attempted in summer with a load of 1 person per 10 square ft of floor; using natural ventilation, however, this temperature will not exceed 85°F except about 5% of a normal year; for this 5% level, 85°F will not be exceeded if occupancy is reduced to 1 per 16 square ft; considerably more ventilation was received with the updraft than with cross ventilation.

(HEIAS)

R 8

26,227

Chaney, R.E. WHOLE-BODY VIBRATION OF STANDING SUBJECTS. Contract NONR 2994(00), Rep. D3 6779, Aug. 1965, 59pp. Military Airplane Div., Boeing Company, Wichita, Kan.

5 male volunteers were utilized in a study of subjective response to vibration while in the standing position. 4 reaction levels (perceptible, mildly annoying, extremely annoying and alarming) were established in the range of 1 through 27 cps utilizing the Boeing Human Vibration Facility as the test instrument. Experimental procedures and controls were identical to a previous study in which the Ss were seated. The "annoying" levels established were at higher acceleration input values than their counterparts of the seated studies, with only minor variations in the "perceptible" and "alarming" curves under the 2 conditions. Possible explanations of the noted differences, physiological effects of vibration on the standing S, and body absorption characteristics and their relationship to the S's reactions are discussed.

R 4

26,228

USN Submarine Medical Center. THE NSMC SONAR OPERATOR ALERTNESS RESEARCH APPARATUS: DESCRIPTION AND INSTRUCTIONS FOR USE. BuMed Proj. MF022.03.03 9020.03, Spec. Rep. 65 6, Sept. 1965, 9pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 477357)

An inexpensive automatic system was derived to present signals and background noise to a listener, and to record his responses (together with strengths of signals and noise) so that over extended vigilance testing sessions the detection performance of the operator may be specified at selected intervals. The system is useful as a research tool in specifying differences among listeners in detection ability, in resistance to monotony, in effect of signal density, time on watch, drugs, group interactions, etc.

26,229

Veghte, J.H. INFRARED THERMOGRAPHY OF SUBJECTS IN DIVERSE ENVIRONMENTS. Proj. 8238, Task 823801, AAL TR 65 18, Dec. 1965, 24pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (AD 629348)

Infrared thermograms were made with a scanning radiometer of 15 nude Ss exposed to environments of 4° & 23°C for 2 hrs. and sweating Ss exposed to an environment of 27°C for 10 min. Surface temperatures of 41 different body areas were determined by relating calculated temperature values for a gray scale on each thermogram with densitometer readings. Surface temperatures were found to be more variable in the cold, 8° to 15°C, with an average mean temperature of 11°C. The nose, pectoral area, patella, gluteus maximus and fatty tissue about the waist were cold regions whereas the upper chest, forehead and spinal column were warm regions. In a comfortable environment, the Ss' surface temperatures were less variable, 25° to 29°C. Surface temperatures of Ss in comfort environments show similar differences between identical body regions as seen in the cold, but the magnitude of the temperature gradients was less. Sweating Ss had uniform surface temperatures, mean 33°C, with only small variations. These data were used to compare various methods for determining mean skin temperatures.

R 33

26,230

Wyatt, R.H. OPTIMAL THREE-DIMENSIONAL WORK PLACE FOR THE SEATED WORKER. 'M.S. Thesis to the Graduate Faculty, Texas Technological College, Lubbock, Texas,' May 1965, 74pp. School of Engineering, Texas Technological College, Lubbock, Tex. (AD 617288)

This study investigated the work area used in the performance of small, manual production or assembly jobs to determine the best shape for this three-dimensional space based upon the variable factors which affect work performance times. 3 male Ss served. Times required to move a stylus between any of 140 points in the work place were recorded for each S with weights of .02, .52, and 1.02 lbs. The variables examined included distance moved, vertical angle, horizontal angle, and weight carried. In the analysis of variance, all of these main effects were found to be significant except weight and this factor interacted significantly with the others. The data indicate that the best combination of horizontal and vertical angles is 40 and 60 degrees respectively--the outer perimeter of an optimally shaped work space must be elongated in this direction.

R 7

26,231

Kama, W.N. VOLUMETRIC WORKSPACE STUDY. PART II. OPTIMUM WORKSPACE CONFIGURATION FOR USE OF WRENCHES. FINAL REPORT, Proj. 7184, Task 718406, AMRL TDR 63 68(11), Dec. 1965, 27pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

This study was conducted to establish the functional relationship between available workspace and the time required to remove and to replace 2 self-locking hexagonal nuts. The experiment involved the following variables: a) wrench type, a 6-in long open-end or 7-in long ratchet; b) workspace depth, 15, 30, & 45 cm (6, 12, & 18 in); c) aperture size, 20, 25, 30, 35, & 40 cm (8, 10, 12, 14, & 16 in); and d) task location within the workspace (left side, right side, top, bottom, or rear). 21 Ss were divided into 3 groups of 7 Ss each. For a given group, depth was held constant as Ss using their right hand performed the task under 25 different conditions. These conditions were determined by the combination of 5 aperture sizes and 5 different task locations. The 25 conditions were performed twice, once using the open-end and once using the ratchet wrench. Major results of this study (within the range of conditions explored) are as follows. 1st, regardless of the type of wrench used, work times decreased as aperture size increased. However, increasing aperture size beyond 30 cm (12 in) did not appreciably shorten work times. Work times using the ratchet wrench were considerably faster than those obtained with the open-end wrench. 2nd, the best overall performance times were obtained at the rear location. The next best times were obtained at the left side and bottom locations, while the right side and top locations yielded the worst times. 3rd, except at the smaller aperture sizes, depth had little effect on performance of the required task, work times being similar for the 3 depths.

R 1

26,232

Nefedov, Yu.G. (Ed.). PROBLEMS OF RADIATION SAFETY IN SPACE FLIGHTS. PHYSICAL AND BIOLOGICAL STUDIES WITH HIGH-ENERGY PROTONS. NASA TT F 353, Dec. 1965, 240pp. National Aeronautics & Space Administration, Washington, D.C. (Transl: (Russian) 1964).

This monograph presents the results of physical and biological experiments performed with high-energy protons in the synchrocyclotron of the United Institute of Atomic Investigations. The chapter topics include: characteristics of the radiation effect under space flight conditions and ways to determine admissible radiation levels; dosimetric investigations and shielding studies; biological effect of protons with energies of 510 Mev in cases of multiple irradiation and during single irradiation; biological effect of protons with energies of 126 Mev on corneal epithelia of mice; biological effect of protons with energies of 510 Mev and X-rays with energies of 180 Kv on hereditary structures; biological effect of protons with energies of 130 Mev, X-rays with energies of 180 Kv and Cob<sup>60</sup> gamma radiation on the vestibular apparatus; biological effect of multiple X-ray irradiation with energies of 180 Kv compared with proton irradiation (doses and temporal distribution); comparative analysis of biological effect of proton radiation with energy of 510 Mev; and prophylaxis and therapy of radiation injuries caused by protons. (HEIAS)

R 222

26,233

Edmonds, E.M. & Wright, R.H. THE EFFECTS OF MAP SCALE ON POSITION LOCATION. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task LOWENTRY, Subtask 1, Tech. Rep. 65 9, Sept. 1965, 20pp. Human Resources Research Office, George Washington University, Alexandria, Va.

This study was conducted to determine the relationship between field position location and map scale. 2 map scales were used--1:25,000 & 1:250,000. 12 Ss were required to mark their position on a map at each of 12 terrain positions. The task was then repeated, utilizing the other scale map. The error in position location was approximately 10 times greater with the 1:250,000 scale map than with the 1:25,000 scale map. However, a significant scale-by-position interaction was found. It was concluded that maps of 1:100,000 or 1:125,000 scale would best meet the tactical target area requirements of Army aviators, and that the 1:250,000 scale map, with certain format changes, would provide the information necessary for en route tactical navigation over moderate or long distances.

R 4

26,234

Tomlinson, Helen. CLASSIFICATION OF INFORMATION TOPICS BY CLUSTERING INTEREST PROFILES. Projs. 6755, 7717, 7719, 7734, PRL TR 65 19, Nov. 1965, 11pp. USAF Personnel Research Lab., Lackland AFB, Tex.

A computer program was applied to cluster indexing terms into field-of-interest categories, defined by responses of staff members of a personnel research laboratory. This provides a practical scheme for document classification. The method clusters successively pairs of topics that have the highest probability of being marked together by the scientist as both being of interest or neither one of interest. 10 fields of interest related to the group mission were identified by this hierarchal grouping.

R 2

26,235

Rowland & Company, Inc. HUMAN JUDGMENT AS A FACTOR IN THE GENERATION OF SHIPS' ALLOWANCE LISTS. Contract N600(23) 63982, R&C Rep. 65 7 100, July 1965, 47pp. USN Purchasing Office, Washington, D.C. (Rowland & Company, Inc., Haddonfield, N.J.).

Consideration of the technical problems associated with development of supply and allowance lists leads to recognition that human judgment plays a profound, albeit often shadowy, role in their construction and use. The discussion contained within the report attributes equivalent significance to military judgment and engineering judgment in assessing the utility of spare components and then goes on to describe specific steps which could be used to experimentally isolate and then quantitatively measure these utilities. Discussion shows concepts which must be scaled and converted to numerical values which will fit into logistic models. A strong case is outlined for conduct of experimentally oriented research carried out in practical settings with suitably experienced research Ss to the end that the data obtained shall possess immediately useful applicability in ship support. Once demonstrated to be effective, the procedures derived above would be standardized and simplified to enable routine utilization as part of normal Navy supply practice.

R 9

26,236

Cronholm, J.N. AN ANALYSIS OF PAIRWISE AGREEMENTS AND DISAGREEMENTS INTO WITHIN AND BETWEEN COMPONENTS. DA Proj. 3A014501B74C, Task 01, Subtask 02, Rep. 625, April 1965, 27pp. USA Medical Research & Development Command, Washington, D.C. (USA Medical Research Lab., Fort Knox, Ky.).

The purpose of this paper has been to describe a method of analyzing pairwise agreements and disagreements among nominally scaled observations into within and between group components. Expected values, biases, sampling variances, and covariances of the components of agreement were derived for the special case of 2 groups. A general method of obtaining exact joint, conditional, and marginal sampling probabilities was described, and several large sample criteria were discussed. The proposed method of agreement and disagreement analysis should prove useful as a means of describing the results of experiments and assessing statistical hypotheses.

R 7

26,237

Buchaca, N.J. & Word, T.J. A HUMAN FACTORS SURVEY AND PRELIMINARY ANALYSIS OF EQUIPMENT IN THE BATHYSCAPH TRIESTE. SR 006 09 02 (11281), NEL N51451, Nel Tech. Memo. 782, March 1965, 99pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

This technical memorandum presents the results of a survey and preliminary analysis of human factors aspects of the bathyscaph TRIESTE. The analysis revealed the need for improvements some of which are being currently implemented. The memorandum should be of interest to NEL personnel concerned with deep submergence, and to contractors and others involved in the design of deep submergence vehicles.

R 7

26,238

Boldt, R.F. SOME TECHNICAL CONSIDERATIONS IN MULTIDIMENSIONAL SCALING. DA R&D PJ 2T013001A708, Tech. Res. Note 159, Aug. 1965, 17pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 623047)

3 problems encountered in executing the analysis of multidimensional scaling data are presented and their resolutions discussed. The first problem is that complex solutions to a quadratic equation may be encountered during Messick-Abelson additive constant iterations. An alternative iteration sequence is presented which necessarily involves only real solutions. This sequence has been successfully used repeatedly. The second problem is that with a poor initial guess at the additive constant, large negative characteristic roots may occur in matrices which theoretically represent scalar products of coordinates of points located in Euclidean space. A factoring method which simply omits these roots will yield a satisfactory solution. The third problem is that when the final additive constant is added to empirically obtained interpoint distances on a ratio scale, the resulting "distance" is often negative. A model sampling study using successive intervals assumptions demonstrates that such negative "distances" can arise as a consequence of sampling fluctuations, and hence, that the occurrence of such distances is not necessarily indicative of an underestimate of the dimensionality of the configuration of stimulus points.

R 16

26,239

Kaplan, H. PREDICTION OF SUCCESS ON ARMY AVIATION TRAINING. DA R&D PJ 2J024701A722, Tech. Res. Rep. 1142, June 1965, 77pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 623046)

High attrition rates among post-World War II Army fixed-wing pilot trainees and helicopter (rotary-wing) pilot trainees became a serious problem in the Army's aviation program as the supply of experienced pilots who had been in the Army Air Corps was exhausted and it became necessary to train men who had had no previous flying experience. At the request of OCSPER, research was initiated in 1955 by the U.S. Army Personnel Research Office to develop instruments to select officers as fixed-wing pilot trainees and enlisted men as warrant officer candidate rotary-wing pilot trainees. Research programs were conducted involving the experimental testing of 2000 enlisted men, 1200 officers, and 1200 ROTC cadets. At the start of the program, major attention was given to development and evaluation of measures to select enlisted personnel for rotary-wing training, including preflight (OCS-type) training to prepare graduates for warrant officer commissioning. A number of interim test batteries, both fixed-wing and rotary-wing, were developed and operationally implemented. In 1963, recommendation was made for the consolidation of the separate selection procedures into a comprehensive program. The present report summarizes the important stages in the separate fixed-wing and rotary-wing research and the more recent effort by which results were integrated in the development of a comprehensive selection program.

R 11

26,240

Ronken, D.A. & Galanter, E. STUDIES OF THE CONSTANT ERROR. Contract NONR 477(34), PLR 14N, Nov. 1965, 38pp. USN Office of Naval Research, Washington, D.C. (University of Washington, Seattle, Wash.).

A series of experiments are reported in which attempts are made to study the role of stimulus variables that may affect the magnitude of the constant error. The results indicate that in addition to bias effects that cannot rightly be ascribed to the stimulus, there are certain forms of potential sequential biases that may or may not be stimulus induced. The classical experiment to investigate the phenomenon is redesigned, and some preliminary results are presented to show that the technique is feasible.

R 23

26,241

Smith, M.H., Jr. ON THE INADEQUACIES OF A LIMITED-STATE THEORY OF THE THRESHOLD. Contract NONR 477(34), PRL 15N, Nov. 1965, 16pp. USN Office of Naval Research, Washington, D.C. (University of Washington, Seattle, Wash.).

A three-state model of detection, based very closely on Luce's two state model, has been proposed and examined in the context of the psychophysical experiment. Although most of the data used to test the model are of doubtful relevance, being of the confidence-judgement variety, they do serve to warn of the possibility of individual differences between Ss. Some Ss may shift from one attitude to another by a change in pure response bias. For most Ss, however, including one run under appropriate conditions, the data did not support the model.

R 4

26,242

Brainard, R.W. & Caum, K.B. EVALUATION OF AN IMAGE QUALITY ENHANCEMENT TECHNIQUE. FINAL REPORT DECEMBER 1962-DECEMBER 1964. Contract AF 33(657) 9686, Proj. 665A, AMRL TR 65 143, Sept. 1965, 92pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (North American Aviation, Incorporated, Columbus, Ohio).

A technique for enhancing the quality of images was investigated. The technique consists of obtaining a video signal from a transparency and adding to this signal its negative second derivative. The technique was investigated by comparing human performance on images produced from the video signal and its derivative with images produced from the video signal alone. 4 classes of images, defined by their content, were investigated: tactical, airfields, aircraft, and artificial 'C' forms. A variety of target detection, classification, and identification tasks were studied, and performance indices such as completeness, accuracy and speed were calculated from the basic performance data. The results indicated that the enhancement technique produces both a statistically and a practically significant improvement in performance. The relative magnitude of the improvement increased as the difficulty of the performance task increased. The enhancement technique improves performance principally by increasing the number of correct responses, and to a lesser extent by reducing the number of incorrect responses.

R 4

26,243

Ward, J.S. & Fooks, N.I. DEVELOPMENT OF IMPROVED RIFLE SQUAD TACTICAL AND PATROLLING PROGRAMS FOR THE LIGHT WEAPONS INFANTRYMAN. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task RIFLEMAN, Subtask IV, Tech. Rep. 65 16, Dec. 1965, 121pp. Human Resources Research Office, George Washington University, Alexandria, Va. (AD 628667)

This report, on the final subtask of Task RIFLEMAN, presents and evaluates the improved Rifle Squad Tactical and Patrolling training programs developed to increase the combat proficiency of the Light Weapons Infantryman in Advanced Individual Training (MOS 111.0). The specific objective was to enable the trainee: a) to integrate previously learned skills and knowledges into effective combat behaviors; b) to coordinate their use with those of fellow squad members; and c) to execute tactical actions on orders of squad leaders. The method of research included: a) observation of current training and interviews with experienced instructors at Army training centers in order to identify LWI performance deficiencies; b) derivation of training content from official Army literature and RIFLEMAN I LWI job descriptions; and b) sequencing of training content into learning units consisting of exercises to form a complete combat action, progressing from emphasis on individual skills to integration of those skills in the squad. The resulting experimental program was administered to 2 companies of AIT trainees at Fort Ord, California, and was rated as more, or much more, effective than existing programs.

R 6

26,244

Luria, S.M., Kinney, JoAnn S. & Weissman, S. ESTIMATION OF SIZE AND DISTANCE UNDERWATER. Proj. MF011.99 9002.02, MRL Rep. 462, Dec. 1965, 7pp. USN Submarine Medical Center, Groton, Conn.

A comparison was made of estimates of both the size and distance of unknown objects in air and in water. Estimates were made both by trained SCUBA divers and by randomly selected Ss. A 4-in square target was positioned at 5 & 12 ft from the S for the size estimates and at 1 ft intervals from 4 to 15 ft for the distance estimates. The observations in air were made out of doors and the underwater observations were made from a porthole in a submerged tower. It was found that the estimates of size were reasonably accurate in both air and water, but they were somewhat larger in water; the increase corresponded to the increase in the size of the retinal image as a result of the refraction of light waves passing from water to air, by the main group of Ss, but not by the divers. The overestimations increased with increasing distance and the variability was greater in water. Similar overestimations of distance were shown to occur in air when the visual cues which are normally present were sharply reduced. It was concluded that, in unstructured visual fields, estimates of distance are generally too large.

R 9

26,245

Luria, S.M. & Weissman, S. EFFECT OF STIMULUS DURATION ON THE PERCEPTION OF RED-GREEN AND YELLOW-BLUE MIXTURES. J. Opt. Soc. Amer., Sept. 1965, 55(9), 1068-1072. (USN Submarine Medical Center, Groton, Conn.).

Thresholds for the perception of red and green or for blue and yellow, presented in 2-color mixtures, were measured at exposure durations of 20, 50, 100, and 300 msec at the fovea and 6° above the fovea, at a constant luminance of 0.12 ft-L. Mdn foveal thresholds for red and green were constant from 300 to 50 msec and decreased slightly at 20 msec; at 6°, sensitivity to both red and green declined with decreasing exposure time. Mdn thresholds for blue deteriorated as exposure time decreased from 300 to 100 msec, but improved with further reductions in stimulus duration. The Mdn yellow thresholds declined as exposure time was reduced below 100 msec. The results are compared with previous data obtained as a function of retinal position and luminance and with similar thresholds measured under conditions of constant brightness. The results are also discussed in relation to various estimates of the "risetimes" of different colors.

R 18

26,248

Rohles, F.H., Jr. A PSYCHOLOGIST LOOKS AT AIR MOVEMENT. ASHRAE J., July 1965, 48-49. (Environmental Research Institute, Kansas State University, Manhattan, Kan.). (Reprint)

In this study a hypothesis was formulated to explain the general affective qualities of wind under varying temperature conditions. Shown graphically in the article, it states that when the ambient temperature is low, a wind of a given velocity is unpleasant; when the temperatures are slightly above the comfort zone (80-90 F), the same wind is pleasant; and when the temperature is high, the wind is again unpleasant. An apparatus was constructed to test this hypothesis. 2 monkeys served as Ss. The procedure used in the present study used wind in place of electric shock in a modification of the following technique: An animal must press a lever to delay the delivery of an electric shock for 20 seconds. If the animal does not press the lever at least once every 20 seconds it is shocked once every 3 seconds until it does respond. The animals worked on this task for 15 minutes and rested 15 minutes for 5 hours when the wind velocities were 5, 10, and 20 mph and the ambient temperatures were 50, 60, and 70 F. The results of an analysis of variance showed that there was a statistically reliable difference between temperatures and wind velocities. All winds of 10 mph and greater were avoided and concluded to be unpleasant. Therefore, the hypothesis stated earlier is true only when the wind is less than 5 mph.

R 2

26,249

Ambler, Rosalie K. & Guedry, F.E., Jr. THE VALIDITY OF A BRIEF VESTIBULAR DISORIENTATION TEST IN SCREENING PILOT TRAINEES. Contract NASA Order R 47, BuMed Proj. MR005.13 6001, Subtask 1, NAMI 947, Rep. 122, Oct. 1965, 9pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

A Brief Vestibular Disorientation Test (BVDt) has been developed that involves on assessment of reactions produced by head movements in a rotating chair. Reliability of measurement has been demonstrated. This study investigated the validity of the test for predicting pilot training criteria. The BVDt was administered to 226 naval aviation trainees during the latter part of their pre-flight training. After the Ss had either completed training or separated therefrom, the test results were evaluated for their relation to the following criteria: a) students separated from flight training for all causes vs. completions; b) tension and/or airsick separations vs. all others; and c) airsick separations vs. all others. Relationships existed between high sensitivity scores on the BVDt and membership in the various separation groups. The airsick separation group had the highest mean score. Evidence indicates that the BVDt ratings tap a significant portion of the flight criterion variance not reached by the present prediction methods.

R 11

26,250

Waller, T.G. & Wright, R.H. THE EFFECT OF TRAINING ON ACCURACY OF ANGLE ESTIMATION. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task LOWENTRY, Subtask 1, Tech. Rep. 65 8, Aug. 1965, 32pp. Human Resources Research Office, George Washington University, Alexandria, Va.).

This study examined the feasibility of using direct perceptual estimation on maps to determine angles of drift, and the effect of training on this ability. Ss were divided into a control group and 2 training groups, 1 of which was trained using angles drawn on plain white cards, and the other using angles drawn on both cards and tactical maps. Both training groups initially estimated the size of angles, ranging from 1° to 18°, with a M absolute error of 2.57° and a M algebraic error of -0.20°. After training, absolute error was 1.34° and algebraic error was +0.43°. A job aid consisting of reference angles of 5°, 10°, and 15° did not significantly affect performance on map items, although on card items, performance of the training groups shifted from underestimation to slight overestimation of angle size.

R 3

26,251

Wieseman, F.L. COMPACT HIGH CALORIE RATIONS. Proj. 42 64 01, July 1965, 16pp. USMC Landing Force Development Activities, Quantico, Va. (AD 465942)

The purpose of this study was to evaluate the Food Packet, Survival for use by reconnaissance units. Test and evaluation of the Food Packet, Survival was conducted by the U.S. Army as a survival ration under arctic conditions. Similar tests were conducted at a U.S. Marine Corps Mountain Training Center. The following conclusions were reached: a) That the food packet, survival is not acceptable to reconnaissance troops as a short term daily subsistence item under field operating conditions; b) That the packaging of the food packet, survival is compatible with expected mission assignments of reconnaissance units; c) That the soup and gravy base packet is an acceptable and suitable item to be included in compact high calorie rations for use by reconnaissance units. Several recommendations were made.



26,252

Trow, W.H. & Smith, E.A. FILMSTRIP TECHNIQUES FOR INDIVIDUALIZED INSTRUCTION. FINAL REPORT MAY 1963-MARCH 1964. Contract AF 33(657) 11339, Proj. 1710, Task 171007, AMRL TR 65 78, May 1965, 13pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Graflex, Incorporated, Rochester, N.Y.).

In the preparation of filmed programed instruction, several considerations are involved in the choice between slides and filmstrips. In this report, the considerations of revision, quantity, length, storage, recycling, aspect ratio, change time, random access and continuous repetition are briefly discussed. A comparison of costs of preparing a master of the filmed program and duplicate copies is made. As a guide to the preparation of filmstrips by staff photographers, some of the problems involved are discussed, namely, single-frame cameras, the preparation of flat copy, exposure and splicing. Other film formats with possible application in audio-visual programming are described.

R 5

26,253

Kama, W.N. EFFECT OF AUGMENTED TELEVISION DEPTH CUES ON THE TERMINAL PHASE OF REMOTE DRIVING. FINAL REPORT JANUARY 1964-APRIL 1964. Proj. 8171, Task 817105, AMRL TR 65 6, April 1965, 8pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio.

The ability of 8 untrained Ss to position a mobile remote handling unit in the fore and aft dimension was assessed under each of 4 different viewing conditions. The viewing conditions investigated were: a) direct viewing; b) conventional 2-dimensional (2-D) closed-circuit television; c) 2-D closed-circuit television augmented by shadows at the target; and d) 2-D closed-circuit television augmented by converging light beams moving with the mobile unit. The results indicate that the augmented television conditions (c & d) facilitated successful positioning of the mobile unit. Under the augmented television conditions (c & d) there was a tendency to over-shoot the target slightly. However, the amount and variability of the positioning errors were less under the augmented television conditions than under either the direct viewing condition or the conventional, unaugmented, television condition. The converging light system merits further investigation as a method of providing range information.

R 1

26,254

Peterson, F.E., Lane, N.E. & Kennedy, R.S. THE RELATIONSHIP OF THE EDWARDS PERSONAL PREFERENCE SCHEDULE TO SUCCESS IN NAVAL FLIGHT TRAINING. BuMed Proj. MF022.01.02 5001, Subtask 1, NAMI 946, Rep. 46, Oct. 1965, 9pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

The Edwards Personal Preference Schedule, a forced-choice personality "need" inventory, was evaluated as a predictor of success in naval flight training. The EPPS failed to discriminate between student aviators who completed training successfully and those who dropped voluntarily or failed due to poor performance. The schedule showed little promise as a predictive instrument for flight training.

R 5

26,255

Hamidi, I.B., Drescher, Lillian & Wade, Carol S. SURVEY OF LIFE SCIENCES COMPUTER PROGRAMS. FINAL REPORT, 15 JULY 1963-14 JULY 1964. Contract AF 33(657) 11347, Proj. 7233, Task 723305, AMRL TR 65 113, Nov. 1965, 173pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

A need exists for dissemination of information on the uses of computers in the life sciences. This report attempts to provide the information necessary to locate and request programs or program descriptions and listings. Typical applications in the life sciences are described for general programs on information retrieval, cross-tabulation of data, tests of statistical hypotheses, regression analysis, multivariate analysis, time series analysis, analysis of variance and covariance, mathematical diagnosis, linear programming, simulation, numerical techniques, and matrix algebra. In addition to these general purpose programs, many special purpose programs exist which are applicable within the gamut of research problems. Some specific examples are finding interatomic distances and angles, blood volume analysis, cardiac arrhythmia analysis, etc. The Key-Word-in-Context (KWIC)-Index of life sciences computer programs consisting of: a) the Key-Word Index; b) Author Index; and c) Code-Name Index is given in the final section of the report.

26,256

Hamilton, J.E. EFFECT OF OBSERVER ELEVATION ON THE MOON ILLUSION. Task 630103, SAM TR 65 46, June 1965, 11pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Amer. J. Optom. & Arch. Amer. Acad. Optom., July 1965, 42(7), 417-431).

A study was made to determine if an increase in elevation of an observer above terrain causes a change in the magnitude of the moon illusion and estimation of distance upon the terrain. A method is presented for the measurement of the moon illusion for latitudes of the sky spaced at intervals of 15 degrees between the horizon and the zenith in the daytime sky. The mean ratio of magnitude of this illusion presents a curvilinear function, showing a ratio of 1.13 at 15° to a ratio of 1.31 at 90°. The findings represent a mean ratio of magnitude for 4 observer levels from ground level to 98 feet. A comparison was made to determine a relationship between the magnitude of the illusion at different observer elevations and the corresponding estimation of distance. It was found that a general decrease in the magnitude of the moon illusion coincides with a general increase in estimated distance when an observer ascends from a point above a terrain. Evidence is lacking to support the apparent-distance theory when an observer ascends above a terrain.

R 10

26,257

Alexander, T.A., Bessey, R.L. & Lawler, E.R. RESEARCH FOR OCULAR EFFECTS OF THERMAL RADIATION. FINAL REPORT. Contract AF 41(609) 2464, Proj. 6301, Task 630103, Dec. 1965, 53pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Technology Incorporated, San Antonio, Tex.).

To study minimal retinal burns in test rabbits, Technology Incorporated designed and fabricated a solid-state circuit to pulse a xenon light source up to 5000 amps. for 1 msec. Procedures to irradiate the rabbits and to calibrate the light source are described. Data for 1.05-mm-diameter minimal retinal burns were obtained. For 1 rabbit, this data was plotted and a theoretical equation was fitted to the curve. This data and theoretical equation can now be used for the prediction of minimal retinal burns.

R 6

26,258

Niven, J.L., Hixson, W.C. & Correia, M.J. ELICITATION OF HORIZONTAL NYSTAGMUS BY PERIODIC LINEAR ACCELERATION. Contract NASA order R 93, BuMed. Proj. MR005.13 6001, Subtask 1, NAMI 953, Rep. 128, Dec. 1965, 19pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

4 Ss in each of 4 different body orientations were exposed to periodic linear acceleration stimuli produced by simple harmonic translation of 0.2, 0.4, & 0.8 cps cyclic frequency along an Earth horizontal axis. Highly systematic horizontal nystagmus was demonstrated in response to these stimuli as well as to linear accelerations of rotating vector form equivalent to counterrotation in a constant magnitude linear force field. Vertical nystagmus could not be demonstrated for similar stimuli. The magnitude of the slow component of nystagmus and the phase lag of the nystagmic response behind the linear acceleration stimulus were found to differ from those associated with periodic angular stimulation of the semicircular canals in a comparable frequency range. Regardless of stimulus form, the effective stimulus element for elicitation of horizontal nystagmus appeared to be dynamic change in the linear acceleration component directed along the S's y (left-right) head axis.

R 9

26,259

Smith, E.A., Williams, G.S. & Mohlman, H.T. GONIOPHOTOMETER TO MEASURE DIFFUSION CHARACTERISTICS OF REAR PROJECTION SCREENS. FINAL REPORT DECEMBER 1964-OCTOBER 1965. Contract AF 33 (615) 2348, Proj. 1710, Task 171007, AMRL TR 65 207, Dec. 1965, 26pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (University of Dayton Research Institute, Dayton, Ohio).

A goniophotometer has been developed for use in measuring the diffusion characteristics of rear projection screen materials. Rear projection screens provide a wide range of possible diffusion characteristics. Similarly, different applications require different characteristics. The goniophotometer will facilitate the selection of screens most suitable for a particular application. Primary components of the device include a light tight chassis, a light source mounted on an arm which can be rotated  $\pm 60^\circ$ , a holder for screen specimens, a specifically designed photometer, and 2 interior ambient light panels and associated interior ft-c m. Schematics, wiring diagrams, and drawings necessary for the fabrication of additional units are included.

26,260

Harshbarger, J.H. DEVELOPMENT OF A HIGH RESOLUTION RESEARCH TELEVISION SYSTEM. FINAL REPORT JULY 1965-SEPTEMBER 1965. Contract AF33(615) 3144, Proj. 6114, Task 611405, AMRL TR 65 235, Dec. 1965, 25pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Research Laboratories, Inc., Dayton, Ohio).

As a basis for the evaluation of high resolution television displays for their possible application to visual simulation training technique, a high resolution television system was developed to provide high quality signals which will drive the display devices which were to be evaluated. As a result of previous research, a 1029-scanning line television system had been developed. Limitations in this single camera arrangement restricted the research which could be conducted into high resolution devices. A larger, higher quality system was required to carry the research study to greater levels of performance with less effort lost due to maintenance and adjustment. The system constructed combines newly purchased devices modified as required for the application together with some specially developed items and other government furnished equipment which was modified and integrated into the system. The design approach which led to the particular system concept employed is explained also. The equipment itself is described in detail with schematics and interconnection diagrams provided for special pieces of equipment. The effort is considered successful, as documented by photographs of displays achieved through the system.

26,261

Sjoberg, L. A NOTE ON CONJOINT MEASUREMENT AND BROWN'S HYPOTHESIS OF VELOCITY PERCEPTION. Number 194, June 1965, 4pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

It is proposed that Brown's hypothesis, according to which subjective velocity is proportional to the ratio between apparent distance travelled and subjective time, be tested with conjoint measurement. A re-analysis of some published data on time estimation suggests that the hypothesis may well be expected to give a good approximation to data.

R 3

26,262

Sinyak, V.S. CYBERNETICS IN MILITARY AFFAIRS. JPRS 30,333, TT: 65 31116, May 1965, 36pp. US Joint Publications Research Service, Washington, D.C. (Transl: Atom i Oruzhiye, 1964, 111-154).

This article examines the general laws of cybernetics; considers the primary components of military cybernetics: military information theory, theory of operations research, theory of automation of control of troops, theory of military EVM; and discusses the role of this science as it relates to the processes of the control of weaponry and troops in combat operations. (HEIAS)

R 5

26,263

Horonjeff, R. REQUIREMENTS FOR RUNWAY LIGHTING. Report from: "AIAA Second Annual Meeting, San Francisco, California, July 26-29, 1965." AIAA Paper 65 333, July 1965, 18pp. Transportation & Traffic Engineering Institute, University of California, Berkeley, Calif.

Runway lighting requirements for Category II operations (Operations below 2600 ft Runway Visual Range (RVR) and down to 1200 ft RVR) were analyzed assuming the see-to-land concept will prevail over electronic guidance in this kind of weather. The problems are considered under the topics: visual requirements and design of visual aids--light patterns and intensity, cockpit vision--over-the-nose-vision angle relative to speed and pitch as well as eye position, and the specific factors involved in establishing the photometric requirements, e.g. background brightness. Also the major findings in the Fog Chamber for operations in 1200 ft of visual range are summarized. It was concluded that precision in measuring and reporting visibility is probably the weakest element in the overall system of poor-weather landing.

HEIAS

R 15

26,264  
Crook, M.N. HANDWRITTEN CHARACTER RECOGNITION. Report from: "Proceedings of Conference on Improved Highway Engineering Productive, May 19-21, 1965, pp. 27-35." May 1965, 6pp. Tufts University, Medford, Mass.

This paper is based on an evaluation study of the performance of the IBM line-follower scanner for handwritten materials which was carried out in 1962. The 1st step provided a measure of machine-reading performance on relatively spontaneous, unconstrained writing. Under this condition, machine reading was 90% to 95% accurate. This is regarded as the score for reading numerals written before training. In the next step, training was given in writing for the machine. Training consisted of explaining to the Ss what characteristics of written numerals the machine had trouble with, and of several rounds of practice with feedback from the machine, after this training, the score for correct reading was around 99%. Further aspects of the interaction between writer and reader are discussed. Implications of these data are fully considered. (HEIAS)

26,265  
MacNeill, R.F. COLORS AND LEGIBILITY: CAUTION AND WARNING DATA-PLATES. Tech. Note 3 65, Nov. 1965, 14pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This study compared the legibility of black printing on a yellow background with the legibility of 5 color combinations often used for caution and warning plates. The plates were tested under 3 light levels; low red, low white, and high white. Results showed that black on yellow and white on black were significantly more legible than the other 4 color combinations in at least 1 of the light levels, as well as when data were pooled for all 3 light levels.

R 14

26,266  
Clark, B. & Graybiel, A. FACTORS CONTRIBUTING TO THE DELAY IN THE PERCEPTION OF THE OCULO-GRAVIC ILLUSION. Contract NASA Order R 93, BuMed. Proj. MR005.13 6001, Subtask 1, NSAM 944, Rep. 120, Aug. 1965, 16pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

5 normal and 8 labyrinthine defective men were studied in a Slow Rotation Room to observe the effects of factors which contribute to delay in change in perception of the horizontal following a change in direction of resultant force acting on a S. Results showed very small effects of pre-exposure conditions prior to change in direction of resultant force. Delays in presentation of a luminous target following a change in resultant force and before settings to the visual horizontal occurred, however, produced major, systematic effects on the perception of the visual horizontal. Results are discussed in terms of the interaction of visual and gravitational cues in producing the lag effect.

R 16

26,267  
Gavurin, E.I. AN EVALUATION OF VARIOUS TACHISTOSCOPIC AND WEFT TECHNIQUES IN AIRCRAFT RECOGNITION. FINAL REPORT. Proj. 7885 1P2, Tech. Rep. NAVTRADEVEN IH 40, Nov. 1965, 21pp. USN Training Device Center, Port Washington, N.Y.

The study evaluated some of the basic assumptions, techniques, and procedures underlying current aircraft recognition training. The effectiveness of the WEFT (analytical) vs. the tachistoscopic approach of training, the relative merits of a successive vs. a simultaneous presentation of stimuli, and the role of image exposure time were investigated. Recommendations for current training and additional research are included.

R 4

26,268  
Chorton, P.W. & Ferris, E.E. THE VISILOG: A SYNTHETIC EYE. Contract AF33(657) 11179, AL TDR 64 185, Jan. 1965, 66pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Advanced Electronics Center, General Electric Company, Ithaca, N.Y.). (AD 611539)

The VISILOG is an automatic obstacle avoidance machine whose principle of operation is based upon the analog of the visual senses. The S of this investigation was a stationary slant-perceiving VISILOG, where the slant of a surface is measured by use of the texture density gradient as observed in the retinal plane. Texture density gradients may be measured by scanning a retinal plane image to determine the number of texture elements in a given scan and comparing the values for the near field and far field scans. The accuracy of the VISILOG surface slant-measuring technique is shown to be highly dependent upon the number of texture elements in the field of view scanned. With natural textures, angle and brightness resolution limits of the sensors cause the observed texture to be made of different elements in the near and far field ranges to produce an effect called emergent textures. The measure of texture density gradients cannot be made unless the near and far field range differential is small enough to remain within the same emergent texture range or a method is developed for texture classification.

R 5

26,269  
Samsonova, V.G. OPPOSITE CHANGES IN ELECTROPHYSIOLOGICAL REACTIONS OF THE HUMAN BRAIN IN ADOPTING THE FREQUENCY OF LIGHT FLASHES AT VESTIBULAR AND OPTOKINETIC STIMULI. FTD TT 65 36/1+2, S/0239 064 050 006, May 1965, 10pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Fiziologicheskii Zhurnal SSSR im. I.M. Sechenova, (Russian) 1964, 50(6), 649-654). (AD 616311)

Results of this investigation give bases to assume, that the vestibular-oculomotorial system does not appear to be a simple reflectorial system, synonymously reacting to the stimulation of its various links. The nature of the interaction between those links is such, that the stimulation of vestibular and optomotorial links affects in an opposite manner the level of excitability of the cortical structures, connected with the analysis of light signals. The effect of the vestibular system of the visual one is expressed in its depressing effect on the cortical structures on the visual analyzer, and the eyemotorial system exerts an opposite activating effect on the very same cortical structures.

R 5

26,270

Nickerson, R.S. A NOTE ON THE CONCEPT OF UNCERTAINTY AS APPLIED IN PSYCHOLOGICAL RESEARCH. Proj. 7682, Task 768201, ESD TR 65 222, Oct. 1965, 11pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

This note distinguishes 4 different connotations of "uncertainty" as the term has been used in the psychological literature.

R 5

26,271

Spogen, L.R., Jr., (Proj. Dir.). STATISTICS, QUANTIZATION, & CODING ASPECTS OF THE APPLICATION OF APERIODIC SAMPLING TECHNIQUES TO R-A-D-A SYSTEMS. SUPPLEMENT II. FINAL REPORT, AD 453 724. Contract DA 36 039 SC 80872, USAERDAA Subtask IG6 41209 D534 30/03, Tech. Rep. ECOM 80872 II, (USAERDAA ELCT 3 65), Nov. 1965, 89pp. USA-Electronics Research & Development Activity, Fort Huachuca, Ariz. (Applied Research Lab., University of Arizona, Tucson, Ariz.). (AD 476201)

In general, this report contains statistics of the aperiodic sampled speech signal and the processing attempted to obtain a better performance when employed in a Random Access DIscrete Address (RADA) communication system. To evaluate the benefits of a RADA system employing aperiodic sampling over a system using conventional sampling techniques, it is necessary to realize the statistical parameters of the aperiodic sampled system whereby operations of quantization and coding may be employed to provide efficient operation. The 1st and 2nd order statistics of amplitude and interval are contained in this report. These statistics are accompanied by a detailed discussion of their application to processing techniques such as quantization and coding. The direct application of the 1st order probability function of amplitude indicates the non-linearity required in amplitude quantization. The results of the amplitude quantization are also contained in this report. Studies concerning time quantization were made and the outcome of these studies are reported. Inserted amplitude values in a scheme of sample omission and reinsertion are estimated from the 2nd order probability functions of amplitude. The time position estimate is obtained from the distribution of intervals. A brief study of a possible sample omission and reinsertion scheme is also discussed.

26,272

Stern, J.A., Small, Joyce G., Gross, Karen & Hayden, M.P. PHOTIC STIMULATION - THE ACTIVATION RESPONSE SIMULATED HELICOPTER PHOTIC STIMULATION - EEG ACTIVATION AND SUBJECTIVE SENSATION. FINAL REPORT. Contract DA 49 193 MD 2179, Sept. 1965, 21pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (Psychiatry Dept., Washington University, St. Louis, Mo.). (AD 469900)

This study investigated the effects of 2 different light-dark ratios (1:1 & 50:1), fixed gaze vs visual search, and light intensity on photic stimulation induced EEG "activation", photic driving, eye movement, and subjective sensations. The above parameters of stimulation were chosen to simulate photic stimulation as experienced in the helicopter. Ss used were those who, in previous studies, had demonstrated signs of EEG "activation". The results suggest that 50:1 photic stimulation is consistently less effective in producing EEG "activation", photic driving and reports of discomfort than was true for 1:1 stimulation. It was suggested that the parameters of photic stimulation induced dysphoric sensations as well as production of drowsiness and light sleep deserve further investigation.

R 8

26,273

Cassatt, R.K. AN EVALUATION GUIDE FOR ARMY AVIATION HUMAN FACTORS ENGINEERING REQUIREMENTS. HEL Standard S 5 65, Nov. 1965, 37pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

The U.S. Army Human Engineering Laboratories (HEL) have developed a guide, including criteria for evaluating both the technical aspects of a proposed design, and the Quality Assurance provisions for a contractor's human factors engineering program plan. This model for Army Aviation Materiel was developed to satisfy a number of objectives: a) Clarifying the intent of HEL Standard S-4-65 (25); b) Giving contractors better guidance so they can improve the human factors sections of design proposals; c) Giving U.S. Army Materiel Command project managers a clearer understanding of human factors evaluation techniques and the scope of evaluations, as well as the overall scope of human factors programs; d) Providing a guideline for Government personnel who must evaluate the human factors adequacy of aviation materiel. References indicate selected human factors criteria and methodology that both contractor and U.S. Army personnel should use during evaluations.

R 134

26,274

Kershner, A.M. & Avery, D.L. A STUDY IN INFORMATION PROCESSING: ELECTROLUMINESCENT VS TELETYPE READABILITY OF WEATHER MESSAGES. Proj. 7682, Task 768201, ESD TR 66 149, Dec. 1965, 71pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

An investigation was undertaken to provide a human factors evaluation of an electroluminescent display designed for the presentation of around-the-base weather messages. Time and error data were obtained for 42 Air Force weather, GCA, and pilot personnel in responding to 6 questions for each of 50 weather messages, 25 of which were presented on an electroluminescent display and 25 by conventional teletype format. The few significant differences found do not warrant a conclusion that the electroluminescent format employed is inferior to the conventional teletype format. It is concluded that weather message information processing may be improved by the development of time and error normative data for a standard set of weather messages, thereby permitting the identification of high-error (perhaps error-prone) personnel, by training to improve the interpretation of visibility coding and more specifically, by an improved formatting of fractions concerned with visibility. The suggestion for the development of normative data may have applicability for other military information systems. This study may be of assistance to the display designer and for the training of military and civilian personnel in weather message interpretation. It has value for the improvement of weather message formatting as well as highlighting the importance of appropriate personnel selection and training for tasks involving the processing of information in complex displays. The study further demonstrates the importance of not relying upon premature curbstone judgments of a display feasibility in lieu of an actual experimental test.

26,275

Van Genderen, L. OPERATIONAL EVALUATION OF THE VARIOUS METHODS OF VISUAL DARK ADAPTATION ABOARD FBM SUBMARINES. BuMed Proj. MR005.14 2001 4.08, Memo. Rep. 65 7, Feb. 1965, 11pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn.

A molded styrofoam eye patch has been developed which gives measurably improved adaptation over previously used methods of red lighting without the unacceptable irritative and uncomfortable effects that accompanied the use of previous patches. The new style patches should be made available to the submarine fleet and in particular to FBM submarines. With the use of the patch for adaptation by the periscope operator, re-evaluation of lighting in control rooms should be undertaken.

R 5

26,276

Brainard, R.W. & Ornstein, G.N. IMAGE QUALITY ENHANCEMENT. FINAL REPORT DECEMBER 1962-FEBRUARY 1964. Contract AF 33(616) 7996, Proj. 7183, Task 718302, AMRL TR 65'28, April 1965, 56pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (North American Aviation Incorporated, Columbus, Ohio).

A technique for enhancing the quality of imagery was investigated. The technique consists of obtaining a video signal from a transparency and adding to this signal its first and/or second derivative(s). The efficacy of the technique was evaluated by comparing imagery produced by the video signal and its derivative(s) with imagery produced by the video signal alone. The imagery investigated consisted of standard test patterns and aerial photographs. The processed test patterns were quantitatively analyzed to determine the resolution, contrast and acutance of the imagery. The results indicate: a) differentiation enhances image quality, as indicated by the resolution, contrast and acutance metrics; b) greatest enhancement is produced by operations which include second-order differentiation, and; c) the least enhancement is produced by first-order differentiation. The aerial photographic imagery shows the same enhancing effects as those obtained with the test patterns.

R 28

26,277

Czeh, R.S., Casper, A.W. & Segraves, E.C., Jr. A MATHEMATICAL MODEL OF FLASHBLINDNESS. FINAL REPORT, 1 NOVEMBER 1964-31 AUGUST 1965. Contract AF41(609)2644, Task 630103, Oct. 1965, 164pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (General Electric Company, Oklahoma City, Okla.).

In planning certain military missions it is desirable to know the extent to which vision may be impaired by the flashblindness that can result from the intense light of a nuclear explosion. This report describes an attempt to provide assistance to such planning by constructing a mathematical model of flashblindness. The literature was surveyed to determine whether or not the construction of a model was feasible. Using selected data, 2 equations were developed for predicting recovery time from flash energy, display luminance, and display visual acuity. The prediction errors made were determined in a few situations and compared with the errors made by other prediction techniques. Limitations of the applicability of the equations were noted.

R 55

26,278

Kunnappas, T. VISUAL PERCEPTION OF CAPITAL LETTERS. MULTIDIMENSIONAL RATIO SCALING AND MULTIDIMENSIONAL SIMILARITY. Number 190, March 1965, 10pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The qualitative similarity of 9 capital letters was studied: a) by the direct multidimensional ratio scaling method and; b) by the method of similarity analysis. 3 factors, 'E', 'O', and 'I', were found. Factor loadings were nearly identical in both methods. A previously proposed equation did not describe the relation between subjective similarity and angular separation of percept vectors.

R 11

26,280

Sterrett, C.S. & Waecker, N.J. ADAPTION OF XM30 CATAPULT TO OPERATIONAL CONDITIONS. TASK I - DESIGN OF CATAPULT, AIRCRAFT EJECTION SEAT: SM31, TASK II - MODIFICATION TO AIRCRAFT SEATS AND ROCKET CATAPULTS FOR ACTUATION OF COMPENSATING NOZZLES. Contract AMCMS Code 4810.16. 8500.1.32, Rep. R 1790, Dec. 1965, 31pp. USA Frankford Arsenal, Philadelphia, Penn. (AD 629517)

This report documents work performed on 2 tasks under "Adaptation of XM30 Catapult to Operational Conditions." Task I, "Design of Catapult, Aircraft Ejections Seat: XM31," describes the design emergent from the combination of rocket catapults XM30 & RAPEC III. This design, while incorporating features of both catapults, has an arrangement for changing the angle of rocket thrust to compensate for changes in seat-man center of gravity due to seat positioning. The XM31 catapult was designed to correct an orientation problem with the RAPEC III catapult in Martin Baker seats. Task II, "Modification of Aircraft Seats and Rocket Catapults for Actuation of Compensating Nozzles," presents the mechanical systems to actuate the swivel nozzles of rocket catapults in F106 & T38 aircraft ejection seats. The XM30 catapult was modified for the F106 seat and a new catapult, the SM32, was designed for the T38 seat. The catapult and seat combinations will correct for misalignment of the seat-man mass center of gravity pattern with the centerline of rocket thrust, due to changes in seat height.

R 2

26,281

Correia, M.J., Hixson, W.C. & Niven, Jorma I. OTOLITH SHEAR AND THE VISUAL PERCEPTION OF FORCE DIRECTION: DISCREPANCIES AND A PROPOSED RESOLUTION. Contract NASA R 93, BuMed Proj. MR005.13 6001, Subtask I, NAMI 951, Rep. 126, Dec. 1965, 73pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

Judgments of subjective vertical and horizon were obtained during exposure to 5 angular directions and 5 magnitudes of linear acceleration stimuli varied independently on a human centrifuge. The visual perception of the orientation of the force field could not be shown to be a linear function of the otolith shear-directed component, and discontinuities in response for identical stimuli were observed. A tangent equation expression which resolves these discrepancies and better predicts the subjective response is proposed. A rationale for this equation and generalizations relative to extraterrestrial environments are discussed.

R 11

26,282

Greenshields, B.D. & Platt, F.N. THE DEVELOPMENT OF A METHOD OF PREDICTING HIGH ACCIDENT AND HIGH VIOLATION DRIVERS. June 1965, 20pp. Civil Engineering Dept., University of Michigan, Ann Arbor, Mich. & Traffic Safety & Highway Improvement Dept., Ford Motor Company, Dearborn, Mich.

In order to gain a better understanding of the highway transportation system consisting of the driver, the vehicle, the highway and the environment it has seemed logical to first examine objectively the behavior of the individual driver and his traffic environment. This article reports the 2nd of 2 studies based on the hypothesis that drivers with different accident experience and driving records exhibit different driving profiles in ordinary driving. The 1st study, as opposed to general opinion, indicated that it is possible to classify drivers. The 2nd study was designed to check and to expand the findings of the first. The refinements in the experimental techniques used in the 2nd series of tests included: a) Improvement of the instrumentation; b) Modifications of the test route; c) More detailed specification of the drivers classifications to obtain "cleaner" groups of drivers: All drivers were checked with state and insurance company records. 4 groups were selected; a control group of 40 with better than average records, 40 high accident drivers, 20 high violation drivers, and 40 beginning drivers; d) More definitive instructions to the test drivers to insure uniform psychological inputs; e) Improvement in the analysis of the data. 4 classes of driving variables were investigated: Traffic variables, Time variables, Vehicle Motion variables and Driver Control variables as measured by the Drivometer. This 2nd series of tests showed significant differences between groups of drivers with a higher degree of confidence in the discrimination between the different groups and an identification of individual drivers than the 1st series. The authors feel this test to be more reliable than any other known procedure.

26,283

Sasaki, E.H. FEASIBILITY OF USING HANDRAILS TO MOVE ALONG A SURFACE WHILE WEIGHTLESS. FINAL REPORT JUNE 1964-OCTOBER 1964. Proj. 7184, Task 718405, AMRL TR 65 152, Aug. 1965, 6pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A preliminary investigation into the feasibility of using handrails as an aid to the astronaut in moving from 1 location to another within or outside a space vehicle was undertaken in a JC-131B zero-G airplane. 8 Ss wearing flying coveralls (1 of whom also performed the tests wearing an inflated full-pressure suit) moved from 1 point to another aided by a single handrail or 2 parallel handrails. 8 conditions were investigated with the parallel handrails spaced from 6 to 36 in. apart and 1 with the single handrail. All Ss were successful in moving across the surface and turning around using both the single and parallel handrails. Motion picture films were taken to evaluate the body positions and ease of movement. The most common position appeared to be one in which the elbows and knees were slightly bent and the torso was nearly parallel to the surface. The parallel handrails spaced from 16 to 24 in. apart appeared to provide the greatest body stability.

26,284

Whitmore, F.C., Linder, R.E. & Bradshaw, W.W. DUAL CHANNEL OPTICAL SYSTEM FOR USE WITH LOW VOLTAGE KERR CELL. FINAL REPORT. Contract AF 41(609) 2709, Dec. 1965, 40pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Southwest Research Institute, San Antonio, Tex.).

A working model of a dual channel window has been constructed which, when used in conjunction with a low-voltage Kerr cell, should provide a useful flash blindness protection device. This 1st-phase program has demonstrated that a large area window structure using a dual-beam approach is feasible provided that an almost Brewster angle beam splitter arrangement is used with dual entrance windows. The resulting apparatus turns out to be too large to be applied to aircraft, but the size should not provide a serious limitation for such applications as ground vehicles. Some preliminary work is also reported which bears on the utility of thin layer liquid crystal systems for application as Brewster mirrors.

26,285

Weasner, M.H. & Carlock, J. SMOKE MARKER DETECTION AND IDENTIFICATION STUDY. AMCMS Code 5135.12.05010, DA Proj. 1X132401D050, Tech. Rep. 3259, Aug. 1965, 56pp. USA Feltman Research Labs., Picatinny Arsenal, Dover, N.J.

A field study was conducted to determine the minimum volume and duration of colored smokes that could be detected, identified, and located by both ground and aerial observers. The distances from observers to smoke emission sites varied from approximately 500 to 10,000 ms. Red, yellow, green, violet, and white smokes were generated by initiating U.S. Army standard M8 and M18 smoke grenades. 9 volume-duration combinations of smoke were tested. Volume of smoke was controlled by initiating various numbers of grenades (1, 2, or 3) simultaneously. Duration of smoke emission was controlled by initiating various numbers of grenades in succession so as to give a continuous smoke. The larger volume-duration combinations (e.g., 2-2 and 3-3) yielded the highest rates of detection, color identification, and correct location of smoke emission sites. Observers located between 500 & 6000 ms from the smoke had higher rates of detection, identification, and location than did observers located at distances greater than 6000 ms. In terms of overall effectiveness, the best volume-duration combination is 2-3. White smoke yielded the highest rates of correct detection, correct identification, and correct location. Red was the next best color, while violet was the poorest.

26,286

Rogers, T.A., Setliff, J.A., Buck, A.C., et al. A COMPARISON, UNDER ARCTIC SURVIVAL CONDITIONS, OF A PEMMICAN TYPE MEAT BAR WITH AN ISOCALORIC RATION OF SUCROSE PLUS ELECTROLYTES. PROGRESS REPORT 1 JANUARY 1964-1 JUNE 1964. Contract AF41(609) 1918, Proj. 8238, Task 823803, AAL TR 65 11, Nov. 1965, 20pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (Pacific Biomedical Research Center, University of Hawaii, Honolulu, Hawaii). (AD 628898)

Previous work has shown that several of the deleterious effects of a fasting, arctic survival situation can be ameliorated by provision of supplemental sodium and as little as 500 kcal/day as sucrose. The basis of current arctic survival ration is "pemmican" or a meat bar composed of powdered lean meat mixed with fat. The present experiment compares, under survival conditions, metabolic changes in men fasting completely, men receiving sucrose and electrolyte supplements, and men receiving the meat bar. 18 men divided into 3 groups of 6 men each, ate a standard diet of USAF IF# 10 rations in barracks for 2 days, then underwent a 7-day simulated survival situation. Group A received no supplement; B received 500 kcal as sucrose daily, plus 150 mEq NaCl on day 1 and 150 mEq NaHCO<sub>3</sub> on days 2-7; C received 500 kcal as meat bar. Mean % weight losses were: Group A, 7.64; Group B, 5.72; Group C, 6.92. Total ketone excretions were respectively 23.7, 2.7 & 11.7 gm. Sodium "balances" were, respectively -249, -388, & -240 mEq. Isocaloric intake of pemmican at this level did not appear to have any great advantage over simple starvation, whereas sucrose with a sodium salt supplement prevented or ameliorated some of the symptoms of starvation. It was concluded that although the caloric density and high protein content of pemmican are advantageous to fully-fed men, pemmican is inferior to sucrose plus sodium salts for severely limited calorie regimens.

R 6

26,287

Miller, Norma D. VISUAL RECOVERY FROM HIGH INTENSITY FLASHES. Contract AF41(609) 2426, Proj. 6301, Task 630103, Tech. Rep. 1, July 1965, 78pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Ohio State University Research Foundation, Columbus, Ohio).

High intensity flashes of 0.04 msec to 1.4 msec duration were used to determine the afterimage brightness as a function of time following the flash. 6 human Ss made continuous matches of the afterimage for periods up to 6 minutes following the flashes. The flash energies ranged from  $3 \times 10^7$  to  $8 \times 10^5$  td·sec or from 0.012 to 0.0003 cal/cm<sup>2</sup> at the retina, neglecting losses in the ocular media. The M afterimage brightness, 5 sec following the highest intensity flashes, was  $10^5$  td. The afterimage brightness data were correlated with recovery time measurements for Sloan-Snellen letters presented at luminance levels from 280 mL to 0.07 mL. The reciprocity relationship between the duration and luminance of flashes subtending 7.5° visual angle was investigated for constant flash energy of  $3 \times 10^7$  td·sec. 7 flash durations from 0.5 to 5.0 msec were tested. The recovery times for the Sloan-Snellen letters at various luminance levels increased approximately 30% following 1.5 msec flashes compared with the 0.5 msec flashes. There was no apparent change for the M recovery times for 4 Ss following flashes from 1.5 msec to 5.0 msec in duration.

R 8

26,288

Mitchell, J. DESCRIPTION OF THE SYSTEMS DESIGN LABORATORY DISPLAY CONSOLES. Contract AF 19(628) 2390, Proj. 250.0, ESD TDR 64 150, Tech. Memo. 03930, Feb. 1965, 54pp. USAF Electronic Systems Div., L.G. Hanscom Field, Bedford, Mass. (Mitre Corporation, Bedford, Mass.). (AD 611753)

6 display consoles have been purchased for the System Design Laboratory (SDL) to facilitate rapid, accurate communications between the SDL data processing facilities and the display operators. These consoles may be connected to any computer able to control IBM 729 series magnetic tape drives. Each console contains a 2048-word magnetic core memory for storing display data which is coded in a highly effective manner. It also contains display storage in the form of a 64-frame film strip any frame of which may be presented on the display. Display generation is very rapid and is capable of showing alphanumeric and special characters, straight lines, and points. The appearance of a number of the special characters is under control of the data processor's program. The display operator is provided with switches, a light pencil, and a typewriter able to generate inquiries or statements for entry into the data processor's program.

26,289

Sharp, E.D. & Hornseth, J.P. THE EFFECTS OF CONTROL LOCATION UPON PERFORMANCE TIME FOR KNOB, TOGGLE SWITCH, AND PUSH BUTTON. FINAL REPORT MARCH 1962-JUNE 1962. Proj. 7184, Task 718405, AMRL TR 65 41, Oct. 1965, 15pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

9 Ss, each restrained in an aircraft seat, operated (with their left hand) each of 3 controls (knob, toggle switch, and push button) at each of 36 locations. Performance time scores for each of the controls were compared and "contour maps" were constructed to display performance-location relationships. These contour maps show that the fastest performance time area for all controls is approximately 25° to the left of the mid-sagittal plane and 25 in above the seat reference point. The fast-performance area for the toggle switch is considerably smaller than that for the knob or push button, suggesting that the selection of a location for a toggle switch may represent a more critical design problem. An analysis of variance of the performance data provided additional comparisons in terms of the effect of angular displacement and console array distance.

R 7

26,290

Harkins, W. SWITCH SYSTEM FOR CONSOLES. Industrial Design, ca. 1965, 1-7. (Micro Switch Div., Honeywell, Freeport, Ill.). (Reprint)

This article describes an encoded switch system, developed by Honeywell for control panels, which minimizes hole punching and wiring yet allows for an unrestricted matrix of different controls related in a unified design. (HEIAS)

26,291

McQuain, D.B., Kresch, A.J., Fox, R.E. & Bowman, R.E. EFFORT TO EVOLVE A METHOD OF EYE PROTECTION FROM FLASH BLINDNESS. FINAL REPORT, 1 JANUARY-31 DECEMBER 1964. Contract AF 41 (609) 2292, Proj. 5830, ca. 1965, 60pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (National Cash Register Company, Dayton, Ohio). (AD 464983)

The photochemical, thermal and spectral properties of 6 representative photochromic compounds were investigated in p-dioxane solutions. There appears to be a considerable variance in the important parameters (quantum yield, thermal rate constants, extinction coefficients, etc.) among the different compounds. Substituents in the 5-position on the Fischer's-base part of the BIPS compound can have a great effect on the quantum efficiency. An extensive study was made on the effect of solvent on the thermal and spectral properties of 5', 7'-dichloro-6'-nitro DIPS. The findings indicate that these properties can be related to solvent polarity in a consistent manner. It is concluded that the chemical environment can have a profound effect on the performance of a photochromic filter element in an eye-protective device. Some new photochromic dyes, which absorb light over the whole visible spectrum, have been synthesized and studied. 1 of these compounds (dye No. 557, 8,8'-dinitro SNAP) was found to have excellent photochemical and spectral properties. Its poor solubility and the fact that the colored species photobleaches, to some extent, when exposed to visible radiation raises doubts as to whether this dye could be successfully incorporated in an eye-protective device.

R 4

26,292

Erdmann, R.L., Clauer, C.K. & Neal, A.S. PRELIMINARY COMPARISON OF POSITIVE AND NEGATIVE IMAGES IN A LEARNING TASK. Tech. Rep. 16.120, March 1965, 16pp. IBM Advanced Systems Development Div., Los Gatos, Calif.

This is a preliminary report of a pilot study of viewing conditions associated with a learning task presented on a rear projection device. For the experimental conditions, the results indicate: a) Ss showed a significant preference for positive images under low ambient illumination and for negative images under high ambient illumination; b) Significantly fewer errors occurred under these preferred viewing conditions; c) In addition, significantly fewer errors were observed under low ambient than under high ambient illumination; d) Time scores were independent of polarity, but significantly higher with high ambient illuminations; e) Ss selected relatively high contrast under all viewing conditions but preferred slightly higher contrast with negative images; f) When permitted to choose, Ss generally selected low ambient illumination. However Ss did not often alter or experiment with the viewing conditions.

R 17

26,293

Hooprich, E.A. AN EXPLORATORY INVESTIGATION OF THE VALUE OF TACHISTOSCOPIC AND READING PACER EXERCISES FOR IMPROVING READING SKILLS. FINAL REPORT. Proj. 3.1703.05.01.1S2, Tech. Bull. 65 14, April 1965, 13pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 464779)

An exploratory study was conducted to try out reading program materials, to obtain tentative answers to certain research questions, and to develop hypotheses for further reading training research. 25 male college students were divided into 3 experimental groups and a control group. The training of one experimental group consisted of tachistoscopic, reading pacer, and reading booklet exercises; another group received reading pacer and booklet exercises; the other did only reading booklet exercises. The major findings, subject to certain qualifications, are as follows: a) The training techniques used in the experiment do produce some improvement in speed of reading popular-magazine type materials, with little loss in comprehension; b) The reading speed gains do transfer to the reading of more technical materials; c) The tachistoscopic exercises used in this experiment apparently do not contribute much to the improvement of reading skills; d) Mechanical devices, such as tachistoscopes and reading pacers, although providing a convenient means of programing training, may not be necessary for the improvement of reading skills. A program of further reading experiments is outlined.

R 1

26,294

Steubing, H.G. COMPUTATION OF THE AVERAGE-RESPONSE FROM ELECTRORETINOGRAM DATA. Proj. WepTask RAE13005/2001/RO05 0101, NADC AC 6501, March 1965, 169pp. USN Aeronautical Computer Lab., NADC, Johnsville, Penn. (AD 461507)

A technique for performing the computation of the average-response of a series of signals and their standard deviation is presented in this report. Electroretinograms were measured and recorded on magnetic tape at the Aerospace Crew Equipment Laboratory. Hybrid and general purpose equipments were employed utilizing this technique to analyze the electroretinogram data at the Naval Air Development Center.

R 1

26,295

Gabriel, R.F., Uyeda, L.R. & Burrows, A.A. AN INVESTIGATION OF LIGHTING IN DISPLAYS WITH SUPERIMPOSED FIELDS WHILE AT LOW LEVELS OF ILLUMINATION. Contract Nonr 4348 (00), Proj. 196 038, Feb. 1965, 54pp. Aircraft Div., Douglas Aircraft Company, Inc., Long Beach, Calif. (AD 613344)

Apart from the continuing use of reticules, collimated weapons sights and other devices superimposing reference images on the ambient field, there is considerable current interest in the concept of a 'heads-up' display. 1 such display involves the projection, collimation, and reflection of display information from the aircraft windshield in front of the pilot. This type of display may interact with the pilot's visual capability at low levels of illumination. A study was performed to determine which of several alternate lighting configurations resulted in the best dual field performance. Both red and white light were used. The concept of pulsed or intermittent lighting was investigated as well. Based on Wald's 2 route theory of rhodopsin regeneration, it was hypothesized that pulsed light might maintain a high level of dark adaptation for the ambient field while providing satisfactory performance on the superimposed display information. A 3-dimensional factorial experimental design allowed the simultaneous evaluation of the intermittency variables as well as the lighting variable. The task involved performing a continuous compensatory tracking task while simultaneously performing an alphanumeric detection-recognition task on moving elements. Results supported the use of white light, at least for the luminance levels used in this experiment (1.0 FT-L for tracking; task; 0.005 FT-L for detection-recognition task).

R 11



26,296

Perry, B.L. THE RAINBOW OPTICAL LANDING AID. Contract NRL Probl. Y02 21, Proj. RS 11 50 016/652 1/F012 06 02, NRL Rep. 6184, Feb. 1965, 20pp. USN Research Lab., ONR, Washington, D.C. (AD 611570) (Naval Res. Rev., July 1965, XVIII(7), 1-7).

This report describes the Rainbow Optical Landing Aid and contains a mathematical analysis of the pilot-aircraft-rainbow-geometry loop. The analysis underscores the salient characteristics of the Rainbow display which lead to precise, easily controlled landings. The Rainbow Optical Landing Aid was developed to provide the pilot with quickened glide path information by means of a color-sequence coded signal. A red-white-blue sequence tells the pilot to increase his sink rate; a red-blue-white sequence indicates that a smaller sink rate is required. A steady green informs the pilot that he is within  $\pm 0.1'$  of glide path. Designed for location on the carrier deck, the Rainbow is strictly an optical-geometrical system requiring no electronics or external inputs. The experimental unit has been used at ranges up to 3.5 mi in bright sunlight, weighs < 50 lbs, and cost < \$1,000.

R 5

26,297

Kinney, G., Manning, S. & Smith, L. FURTHER RESEARCH ON THE EFFECT OF VIEWING ANGLE AND SYMBOL SIZE ON READING EASE. Contract AF19(628) 2390, Proj. 703.0, ESD TRD 64 633, Rep. W 07004, Jan. 1965, 20pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Mitre Corporation, Bedford, Mass.). (AD 610421)

The effects of viewing angle and visual symbol size upon the time required to read familiar words were studied for angles of 90, 60, 45, and 30 degrees and for symbols whose height subtended 16 and 10 minutes of arc at the viewer's eyes. Recommendations for large-board, wall-display layout and viewer seating arrangements are offered.

R 1

26,298

Sturtevant, R.C. THE INTENSITY-TIME RELATIONSHIP FOR FORM IDENTIFICATION. Proj. 8501, Task 850101, RADC TR 65 16, Feb. 1965, 12pp. USAF Display Techniques Branch, RADC, Griffiss AFB, N.Y. (AD 613557)

The purpose of this experiment was to determine the effect of exposure time and intensity on a form identification response such as might be encountered in a military Command and Control display situation. A conventional psychophysical method was used to determine the applicability of the Bunsen-Roscoe Law (Intensity  $\times$  Time = a Constant up to a critical duration; and Intensity = a Constant above a critical duration). Exposure time thresholds were found for 3 Ss for each of 5 geometric forms at each of 5 intensities ranging in value from .005 to 1 foot-lambert. It was found that the Bunsen-Roscoe Law did not hold, but that time was a more important factor than intensity in identifying the forms. The results are discussed in terms of detection vs identification of stimuli, and implications for Command and Control display requirements are pointed out.

R 14

26,299

Leibowitz, H.W. & Sulzer, R.L. AN EVALUATION OF THREE-DIMENSIONAL DISPLAYS. Contract NONR 2300 (05), Working Group Rep. 6, Jan. 1965, 36pp. US Armed Forces-NRC Vision Committee, Washington, D.C.

This report evaluates 3-dimensional displays relative to one another and to other equivalent display types. It is not concerned with the advisability of recommending 3-dimensional displays to the reader who alone has the critical information regarding specific system requirements. However, the general background information included plus information regarding application may provide the necessary basis for such practical system decisions. The report is concerned primarily with volumetric and stereoscopic displays that are viewed with 2 eyes and produce depth principally through retinal disparity. Other displays of 3-coordinate information have been useful for many years and often take the form of 2 or more flat, 2-dimensional views. These conventional displays will, no doubt, continue to find many applications, and detailed discussions of their design and use are found in several references included in this report. This report is concerned, however, with the relatively recent 3-dimensional displays that are currently under development and study by a score of manufacturers and research and development laboratories.

R 60

26,300

Vicino, F.L., Andrews, R.S. & Ringel, S. CONSPICUITY CODING OF UPDATED SYMBOLIC INFORMATION. Proj. DA R&D PJ 2J024701A723, Tech. Res. Note 152, May 1965, 44pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 616600)

Hard copy history failed to improve extraction and improved assimilation only slightly, chiefly when repositioned updates were presented. Performance in both extraction and assimilation was best on slides from which symbols had been removed, poorest on slides in which symbols had been repositioned.

R 7

26,301

Hoffmann, E.R. & Joubert, P.N. THE EFFECT OF CHANGES IN SOME VEHICLE HANDLING VARIABLES ON DRIVER STEERING PERFORMANCE. Rep. HF 9, Dec. 1965, 44pp. Human Factors Group, Mechanical Engineering Dept., University of Melbourne, Melbourne, Australia.

The literature on vehicle handling is summarized. Experiments were carried out to determine the effect of vehicle response time, steering gear ratio, and near and far-sight distances on driver performance on a tracking task consisting of driving through a narrow winding course marked by traffic cones. The vehicle response time was found to affect greatly the number of cones touched by the vehicle during a set testing time. On the particular track used in these tests, the driver performed best when the vehicle response time was 0.20 sec. The near and far distances over which the driver could see the test course were also found to be of importance. Increasing near-sight distance, with no limit on the far-sight distance produced poorer driver performance. This also occurred for the case of decreasing far-sight distance with fixed near-sight distance. Tests with variations of steering ratio and steering torque produced little change in driver performance, although there was a weak minimum in cone scores at a steering ratio  $G=24$ . In some of the experiments reported here, spare mental capacity was measured during the test period. For this indirect measurement of task difficulty, changes in the spare mental capacity of the driver were found to have the same sensitivity to changes in the vehicle, as did the change in the number of cones touched by the vehicle.

R 16

26,302

Williams, P. TECHNICAL PROGRESS REPORT ON UNIVERSAL CONTACT ANALOG DISPLAY (UCAD) RESEARCH. PHASE I. SYSTEMS ANALYSIS 1161 R 0011. Contract Nonr 4489(00), April 1965, 138pp. Norden Div., United Aircraft Corporation, Norwalk, Conn. (AD 616650)

This interim technical report presents the results of the Systems Analysis phase of the Universal Contact Analog Display (UCAD) Research Program, initiated in June 1964. The goal of this research is the development of design specifications for a universal raster-scan TV flight instrument suitable for use in fixed-wing, rotary-wing, and VTOL aircraft. Information parameters have been identified and quantified by means of a systematic analysis of aircraft performance and flight information requirements. The methodology developed for this analysis incorporates 4 basic phases--analysis, design, simulation and evaluation. Mission segments, consisting of common flight maneuvers, have been defined as a result of mission analyses. 20 basic segments are sufficient to describe all missions within the scope of this study. 6 critical mission segments (maximum performance takeoff, VTOL transition, decelerating approach to hover, hover/sonar, loft bombing and carrier landing) have been analyzed in depth to determine detailed performance and information requirements. Loop diagrams are configured for fixed- and rotary-wing aircraft incorporating linear transfer functions. Loop closure functions are established through a root-locus analysis. Aircraft response criteria are developed based on a combination of military handling quality specifications and pilot opinion reports. Optimum system control and minimum pilot burden have been established through a root-locus analysis based on these criteria. Display augmentation requirements have been specified through the allocation of loop closure functions to the pilot/display loop, the AFCS loop, or a combination of both. Total display information requirements for flight control, propulsion systems, and special mission parameters have been established as a result of a commonality study of required usage throughout the mission.

R 13

26,303

Vreuls, D. INFLIGHT METHOD AND MEASUREMENT. Report from: "Ninth Annual Meeting of the Human Factors Society, October 19, 1965." Contract AF33(615)2214, 1965, 5pp. Human Engineering Support Group, Bunker-Ramo Corporation, Randolph AFB, Tex.

This paper discusses how simulator techniques have been applied to inflight research in order to answer questions pertaining to control and display problems in aircraft. The general method used in 12 inflight studies is described in 6 steps--the statement of questions to be answered, subject population, experimental design, measurement (pilot acceptance measures and pilot-system performance measures), data treatment (time history and cumulative error), and statistical treatment. (HEIAS)

26,304

Gannett, J.R. A REVIEW OF FLIGHT AUTOMATION AND INSTRUMENTATION FOR TRANSPORT AIRCRAFT. Report from: "Annual Symposium of The Human Factors Society, Sheraton Hotel, Dayton, Ohio, 18-21 October 1965." 1965, 5pp. Commercial Airplane Div., Boeing Company, Renton, Wash.

The paper discusses the problems of flight instrumentation displays relative to the various phases of operation of these high speed aircraft including automatic control equipment and corrective capability relative to it. (HEIAS)

26,305

Harper, R.P., Jr. PILOT EVALUATION OF HANDLING QUALITIES. Report from: "Ninth Annual Meeting of The Human Factors Society, 18-21 October 1965." 1965, 15pp. Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.

Some of the important factors which affect the quality or applicability of pilot assessment of the handling qualities of airborne vehicles are discussed here. Difficulties have been encountered in finding appropriate performance measures. Pilot comment data are important but difficult to handle. The definition of the mission is a critical item, particularly when the experimental work must be accomplished in a simulation situation. Pilot rating scales must be designed extremely carefully and experiments must be executed with care also. (HEIAS)

R 7

26,306

Garnov, V.V. & Dubovik, A.S. STEREOSCOPIC FILMING OF RAPID PROCESSES BY TWO INDEPENDENTLY OPERATING MOVING PICTURE CAMERAS. NASA TT F 337, Sept. 1965, 8pp. National Aeronautics & Space Administration, Washington, D.C. (Transl: Zhurnal Nauchnoy i Prikladnoy Fotografii i Kinematografii, 1964, 9, 116-121).

A stereoscopic filming method is presented for producing stereoscopic pairs, within a certain allowable time period of desynchronization, by 2 cameras, each working independently. The size of the exposure base, therefore, is of no consequence as each camera has no direct connection with the other. Accuracy of frame synchronization depends on the parameters of filming. Due to the operation of 2 cameras with different frequencies of exposure there occurs a superpositioning of frame exposures--"frequency pulsations." Soil dispersion caused by subterranean explosions is described as investigated by this method. Fulfillment of the conditions of this simultaneous exposure of frames depends on the stability of frequency exposure and for good results it is necessary to maintain exposure frequencies of an accuracy of  $\sim 1\%$ .

R 3

26,307

Parker, J.F., Jr., Reilly, R.E. & Gilbert, R.R. A STUDY OF THE PROTECTION AFFORDED BY LOW-TRANSMISSION VISORS FOR VARYING DURATIONS OF USE. Contract Nonr 4185(00), Rep. 65 1, July 1965, 9pp. USN Physiological Psychology Branch, ONR, Washington, D.C. (BioTechnology, Incorporated, Arlington, Va.).

The following conclusions are drawn from the data of this study: a) the protective effectiveness of the Navy gold-coated protective visor, which transmits 2.75% of the visible energy, is not reduced following extended periods of visor wear. The extent of the dark-adaptation produced by decreased retinal illumination when the visor is used is not significant in terms of an increase in the flash blindness recovery period; b) for totally dark-adapted individuals, there is a minimal increase in flash blindness recovery time, in the order of 1 sec, when exposed to a high-intensity flash while wearing the visor. This situation, however, is not realistic in terms of the operational use of a protective visor.

R 3

26,308

Rogers, J.G., Detambel, M.H. & Bien, Ann R. SHARED SPECTRUM DISPLAY ENHANCEMENT. FINAL REPORT. Contract AF 19(628) 3882, ESD TDR 64 673, HAC Ref. FR 65 10 30, Jan. 1965, 66pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Ground Systems Group, Hughes Aircraft Company, Fullerton, Calif.).

An illumination system is described which utilizes for display, portions of the visible spectrum which have been excluded from the ambient light. The resulting tinted illumination is matched in brightness to a standard white light by experimental Ss, and stimulus threshold measurements made as a function of display intensity for various stimulus and ambient spectra. Certain combinations are found to lower the threshold of detection, indicating enhanced stimulus brightness, whereas others are found to raise the threshold. A close relationship is found between experimental data and results predicted on the basis of previously published increment-threshold measurements.

R 24

26,309

Lankford, E. EXPERIMENTAL INVESTIGATION OF OPTICAL PRESENTATION OF THREE-DIMENSIONAL DISPLAY. Contract Nonr 4439(00), Rep. 00.567, Jan. 1965, 71pp. LTV Astronautics Div., Ling-Temco-Vought, Incorporated, Dallas, Tex. (AD 610150)

The objective of the program was to design and develop 2 experimental prototypes of a volumetric 3-dimensional display utilizing point-light-images generated by cathode ray tubes which are seen by an O located in the real image field of a parabolic and plane mirror. Various approaches of image combining such as time-sharing and light-sharing were investigated. The investigation conducted in the performance of this contract resulted in the verification of the feasibility of the 3-D display concept. Both light-sharing and time-sharing of multiple image presentations are possible means of reproducing images in 3 dimensions. The choice of method is predicated on the specific application. The utilization of 3 dimensional presentation is restricted only by the quality of the data received for presentation, quality of the optic-electro-mechanical system and functional space.

R 3

26,310

Hill, J.H. & Chernikoff, R. ALTIMETER DISPLAY EVALUATION. FINAL REPORT. Contract NRL Problem Y02 11, BuWeps Task RAV 09002/6521/F012 04 06, NRL Rep. 6242, Jan. 1965, 10pp. USN Research Lab., ONR, Washington, D.C. (AD 610664)

A series of investigations has recently been completed to determine the relative effectiveness of various altimeter displays. These investigations, consisting of laboratory research at NRL and flight tests at NATC Patuxent River, were in support of a DOD program concerned with the replacement of current altimeters in most military aircraft with a servo-pneumatic type instrument. 4 types of altimeter presentations, namely the counter-pointer (CP), counter-drum-pointer (CDP), drum-pointer (DP), and 3-pointer (3P), were compared in a series of laboratory experiments measuring reading time and accuracy with both pilots and nonflying enlisted men. The same instruments were also compared by NATC in flight, using the questionnaire technique to elicit pilot judgments. The results of the various phases of laboratory research showed that CP and CDP altimeter presentations ranked highest, followed by the DP, with the 3P consistently lowest. Pilot preference in the flight tests was overwhelmingly in favor of the CDP.

R 7

26,311

Oatman, Lynn C. CHECK-READING ACCURACY AS A FUNCTION OF DIAL ALIGNMENT IN AN EXTENDED-POINTER DIAL DISPLAY. AMCMS Code 5011.11.841, Tech. Memo. 2 65, Feb. 1965, 15pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 616881)

2 simulated dial displays were compared in a check-reading task. The pointers were aligned at 12 o'clock in 1 display and at 9 o'clock in the other. The dial displays were presented to 30 Ss who were asked to indicate whether the display contained a deviant pointer and, if so, to locate it. The data indicate that Ss performed about equally well with the 2 pointer alignments. Locations of the deviant dials within the displays were an important determinant of the number of deviant pointers detected.

R 16

26,312

Meldrum, J.F. AUTOMOBILE DRIVER EYE POSITION. Report from: "Mid-Year Meeting, Chicago, Illinois, May 17-21, 1965." Rep. 650464, 1965, 17pp. Society of Automotive Engineers, New York, N.Y. (Human Factors Research Dept., Ford Motor Company, Dearborn, Mich.).

A driver eye position survey, (involving over 2300 Ss and 3 1963 convertible cars--Ford, Plymouth, & Chevrolet), was held to provide the automobile industry with standardized data on driver eye location. This project was suggested by the Manikin Subcommittee of the SAE Body Engineering Committee, and was carried out as a joint industry effort with personnel from that Subcommittee. Coordinate anthropometric measurements of eye position and top-of-head were recorded on film, using a special photogrammetric technique. Data were smoothed into ellipse-shaped tangent cutoff percentile contours referenced to car body inch-lines and to points on the manikin. Results revealed a new shape to the driver's eye position zone, compared to the area outlined in SAE J906, Glazing Manual.

26,313

Meldrum, J.F. DRIVER EYE POSITION. Tech. Rep. S 65 3, April 1965, 109pp. Human Factors Research Dept., Ford Motor Company, Dearborn, Mich.

Over 2300 visitors to the Ford Rouge tours were measured photographically while seated in 1 of 3 1963 convertibles: a Ford, Plymouth, and Chevrolet. Full-scale percentile curves for eye and top-of-head position were calculated, with reference both to the car body inch-line system, and to the standard H-point, separately for each of the car lines and also in an industry composite. These percentile contours can be used either to design the package from the standpoint of a specified driver visibility percentile, or to evaluate the resulting visibility of previous designs. Three-dimensional contours were also calculated, and these can be used to construct physical models of the eye space for use in direct design, or at least evaluation of, clay instrument panel and seating bunks.

26,314

Garren, J.F., Jr., Kelly, J.R. & Reeder, J.P. A VISUAL FLIGHT INVESTIGATION OF HOVERING AND LOW-SPEED VTOL CONTROL REQUIREMENTS. NASA TN D 2788, April 1965, 16pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A visual flight investigation was conducted with a variable-stability helicopter to contribute toward a basis for establishing VTOL control requirements relative to control power and sensitivity. Control power is defined herein as the maximum angular acceleration which can be produced from a trimmed flight condition, and sensitivity is defined as the angular acceleration per in of control. In order to permit variations in control power independently of sensitivity, variable-control travel stops were located on the pitch, roll, and yaw controls. A variety of visual tasks was performed including forward, rearward, and sideward flight, quick starts and stops, roll reversals, and hovering turns. The angular velocity damping was held constant at the minimum value required by current specifications throughout most of the investigation. The simulation technique which was employed eliminated trim changes and resisted external angular disturbances. The results of this investigation indicated that control power was the primary factor which influenced the pilots' ratings of the aircraft's maneuverability whereas sensitivity had only a minor effect. For the performance of precision tasks, neither control power nor sensitivity had an appreciable effect on pilot rating for the range of parameters covered. Comparisons of the minimum satisfactory control power obtained for the maneuver tasks with current VTOL specifications indicated reasonably good agreement (between 3% & 20% for all axes).

R 10

26,315

Westheimer, G. A METHOD OF PHOTOELECTRIC KERATOSCOPY. Amer. J. Optom. & Arch. Amer. Acad. Optom., May 1965, 315-320. (University of California School of Optometry, Berkeley, Calif.).

A new technique of keratoscopy is described. It employs an incident beam that is swept across the cornea by a rotating lucite cube. The direction of the reflected beam is detected by an array of photocells. A theoretical discussion of the method of photoelectric keratoscopy is included, as well sample recordings. (HEIAS)

26,316

Hierbaum, F.F., Jr. & Yulo, C. UAL/FAA ATC RADAR BEACON ALTITUDE REPORTING TEST. FINAL REPORT. Proj. 242 006 03X, Rep. RD 65 10, Jan 1965, 24pp. US Systems Research & Development Service, FAA, Atlantic City, N.J. (AD 613477)

The National Aviation Facilities Experimental Center monitored 186 flights of 25 different United Air Lines Boeing 727 aircraft and 17 flights of 3 different Douglas DC-8F aircraft, all equipped with Air Traffic Control Radar Beacon System (ATCRBS) automatic altitude reporting capability. The participating aircraft were equipped with 2 different types of automatic altitude reporting configurations, and 2 different types of ground decoding and display systems were used. Information was gathered on adequacy of the ATCRBS pressure altitude transmission medium, the technical integrity of the 2 specific decoding and display systems, and correspondence between the pilot altitude display in the cockpit and the radar beacon altitude display at the ground facility.

26,317

Carel, W.L. ANALYSIS OF PICTORIAL DISPLAYS. THIRD QUARTERLY PROGRESS REPORT. Contract NONR 4468(00), JANAIR Rep. 2732.01/25, March 1965, 71pp. Aerospace Group, Hughes Aircraft Company, Culver City, Calif. (AD 613274)

This report discusses 2 topics: pictorial display potential and display requirements. The greatest potential use for aircraft pictorial displays is for crew tasks that demand the observation of the relations between a large N aircraft performance, navigation, target recognition and tactics. The major portion of the report is a discussion of a series of displays applied to these tasks and evaluated relative to various mission phases, e.g. landing, low level flight, weapon delivery; and display requirements, e.g. symbology and content, information required, data rate, display size, resolution.

R 5

26,318

Rosenheck, A.J., Regonese, F.L., Foster, E.J., DiMattia, A.L., et al. TRANSDUCER AND INTER-COMMUNICATION SYSTEM FOR AIR CREWMAN'S PROTECTIVE HEADGEAR. FINAL REPORT. Contract DA 28 043 AMC 00282(E), DA Proj. 166 41209 D 534 24 10, Rep. 4, Sept. 1965, 156pp. USA Electronics Command, Fort Monmouth, N.J. (CBS Laboratories, Columbia Broadcasting System, Inc., Stamford, Conn.). (AD 628980)

This report describes work performed in the development of a helmet transducer and cordless intercom system. An improved ear cushion was developed as well as a practical noise shield. A final model earphone enclosure assembly was developed and incorporated into the APH-5 helmet. The development of a model of a wireless voice intercom system is also described. (HEIAS)

26,319

Dyer, W.R. & Christman, R.J. RELATIVE INFLUENCE OF TIME, COMPLEXITY, AND DENSITY ON UTILIZATION OF CODED LARGE-SCALE DISPLAYS. FINAL REPORT JUNE 1964-MARCH 1965. Proj. 5597, Task 559705, RADC TR 65 325, Sept. 1965, 25pp. USAF Display Techniques Branch, Griffiss AFB, N.Y.

A study was accomplished to demonstrate the influence of display coding on a task of locating and identifying specific entries in a numerical matrix. Various relationships among factors of matrix size, complexity, and viewing time were determined and are presented in graphic form. In addition to demonstrating the expected efficacy of coding, several additional findings were revealed. It was found that coding is of particular value when search time is limited, and that as the difficulty of the task increases, the value of coding also increases. It was also shown that, with longer search times available, the relative value of coding appeared to increase. This finding was interpreted as the result of a 2-stage data extraction effort: the 1st stage being a locating of the pertinent data entries, the 2nd stage being the actual reading of the displayed values.

R 6

26,320

Reilly, R.E., Gilbert, R.R., Dillon, R.F. & Parker, J.F., Jr. THE TRANSLATION OF VISUAL INFORMATION INTO VEHICULAR CONTROL ACTIONS. BTI Rep. 65 2, Oct. 1965, 50pp. BioTechnology, Incorporated, Arlington, Va.

This study examined certain items of visual information available from the vehicle tail-light system and the way in which it might be used by a driver as a basis for specific vehicular control actions. In particular, the angular velocity cue provided by the increase in the visual angle subtended by the 2 taillights as a driver approaches was studied. There is evidence of a functional relationship between angular velocity cue and distance at which deceleration begins which is weighted in terms of vehicle velocity. Also, though other cues provide important perceptual information, persons operate in terms of the entire visual environment and make adjustments when specific cues are distorted or manipulated. There was no indication that magnitude of deceleration force was guided by angular acceleration cue existing at the moment of brake application. The data show that specific characteristics of tail-light systems have a significant effect on braking behavior--a system with large bright lights set at a maximum separation (60 in.) produces a consistently better braking response.

R 10

26,321

Harshbarger, J.H. & Basinger, J.D. TEST AND EVALUATION OF ELECTRONIC IMAGE GENERATION AND PROJECTION DEVICES. VOLUME II - EVALUATION OF TELEVISION SYSTEMS. FINAL REPORT JULY 1964-JULY 1965. Contract AF 33(615) 1889, Proj. 6114, Task 611405, AMRL TR 65 116, Nov. 1965, 137pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Research Laboratories, Inc., Dayton, Ohio).

This report presents data from an evaluation of the 7WP4 Projection Cathode Ray Tube (CRT) operated in the high resolution mode of 1029-line scanning configuration to produce a suitable display for simulation training. The capabilities of the CRT were first predicted by theoretical analysis conducted while the tube was in actual operation, then the actual display was analyzed to confirm the theoretical predictions. The test image projected on a screen was viewed by an observer television camera to reduce the displayed image to electronic waveforms which formed the basis for an accurate evaluation. The results obtained during the practical evaluation of the CRT in all ways confirmed the theoretical predictions. The CRT showed a resolution potential greater than the 800-line prediction, with a high level of brightness, and adequate grey scale linearity. Spot size was found to vary inversely with the scanning speed; line width is reduced at the faster scanning rates. Resolving capability, limited by spot size, is shown related to both brightness and scanning. Also included in this report is data from the evaluation of a monochrome Schmidt projector and a color Schmidt projector. These projectors were subjected only to a Direct Evaluation; no special operating conditions or modifications were used. In both cases, the projectors were evaluated for video amplifier characteristics and geometric precision of the display. The display resolution was measured by use of the observer television camera technique, and the brightness of the display was measured. Results are presented in a graphic manner showing resolution vs display brightness that may be expected from either device.

26,322

Thomas, J.A. & Sadacca, R. ABILITY OF IMAGE INTERPRETERS TO ADAPT OUTPUT TO VARYING REQUIREMENTS FOR COMPLETENESS AND ACCURACY. DA Proj. R&D PJ 2J620901A721, Tech. Res. Note 165, Dec. 1965, 29pp. USA Personnel Research Office, Support Systems Lab., OCRD, Washington, D.C. (AD 631178)

Within the broad objectives of the Surveillance Systems research program, the MAN COMPUTER FUNCTIONS Task is specifically concerned with the allocation of functions and interrelationships among interpreters and computers. The present publication describes an initial study, involving 2 experiments, in the development of procedures through which a computer can aid in the interpretation-decision process. The experiments were conducted to study the effect of providing payoff instructions based on specific intelligence requirements on image interpreter performance in 2 important tasks: a) location and identification of targets in tactical imagery; and b) rapid screening of tactical imagery. 3 sets of instructions were used in each experiment. 1 set emphasized importance of completeness of interpretation; another emphasized importance of achieving a balance between accuracy and completeness; the third emphasized accuracy over completeness. Results of both experiments showed that interpreters can vary their performance as a function of the relative weight given accuracy and completeness of output. Positive results obtained in both experiments point up the need for provision of guidance to interpreters to offset highly variable and subjective evaluations given intelligence requirements. Development of payoff matrices for classes of military situations is suggested.

26,323

Berger, P.K. STUDY OF ATTITUDE CHANGE TOWARD EQUIPMENT DESIGN. THE MEASUREMENT OF ALTIMETER DISPLAY PREFERENCE AND AN INVESTIGATION OF PREFERENCE CORRELATES. Contract Nonr 4097(00), Proj. RR 006 09 01, Tech. Rep. 2, Aug. 1965, 40pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Life Sciences, Inc., Fort Worth, Tex.).

The purpose of this study was to evaluate the test-retest reliability of 2 single item measures of altimeter preference and to investigate some correlates of display preference. 1 Altimeter display has been operational for many yrs. (MA-1 3 Pointer) while the second display is a developmental design (Moving Tape Single Pointer). Adequate reliability for the 2 preference measures was demonstrated. Background and experience variables were not correlated with preference for the displays. Ratings of the 2 displays in various situational contexts significantly predicted display preference. Familiarity was a significant factor in preferences for the MA-1. Expected mechanical reliability of the Moving Tape Single Pointer was not associated with preference. The further investigation of particular equipment characteristics as they relate to preference and preference change was suggested.

R 8

26,324

Hagberg, C. EIGHTH BIMONTHLY PROGRESS REPORT ON COLLECTIVE PROTECTION FOR COMBAT FIELD STRUCTURES. 1 SEPTEMBER-31 OCTOBER 1964. Contract DA 18 108 AMC 214(A), Proj. 52405, Rep. 2711, Jan. 1965, 104pp. USA Edgewood Arsenal, Edgewood Arsenal, Md. (Applied Science Div., Litton Systems, Inc., St. Paul, Minn.). (AD 612659)

The decontamination and protection studies included the evaluation of a battalion aid station, a rest and relief station, and a field medical facility via field tests. Models of collective protection kits for tentage were fabricated, including liners, air locks, 60-cycle separable environmental control systems (ECS), 60-cycle portable fresh air purifiers, and the needed accessories for installing the kits in the GPT Medium. 3 liners, 1 each for a GPT Medium, a GPT Large, and a command post (CP) tent; 3 10-ft long air locks; 3 400-cycle ECS's; and the necessary support and ground anchor equipment for the field medical facility were fabricated and tested. The 10-man positive pressure pod systems were studied in detail: new concepts in pod designs were analyzed, a beam supported model was developed, and power sources for self-contained systems were reviewed. Work on 3 different types of ECS packages: electrical heating, gas fired heating, and heat pump was expanded as was the program for developing a suitable pod configuration. (HEIAS)

R 11

26,325

Casby, J.U. & Normann, N.A. CORRELOGRAPHIC ANALYSIS OF AFFERENT AND EFFERENT ACTIVITY DURING THE JERK REFLEX. FINAL REPORT MAY 1964-JUNE 1965. Contract AF 33(615) 1783, Proj. 7233, Task 723304, AMRL TR 65 171, Dec. 1965, 51pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Hamilton Standard Div., United Aircraft Corporation, Windsor Locks, Conn.).

Cross-correlation techniques were applied to an analysis of the afferent and efferent nerve traffic associated with the ankle jerk reflex. Primary afferent, secondary afferent and Golgi tendon fiber activity could be detected and monitored and the time course of their activity is shown. The alpha efferent activity could be monitored also and is displayed. The technique was not adequate to show the time course of the gamma efferent activity but some indications of its activity are displayed.

R 7

26,326

Senders, J.W. & Ward, Jane L. MULTIPLE CRITERIA FOR ASSESSING TRACKING PERFORMANCE: THE ASSESSMENT OF STEP INPUT TRACKING. FINAL TECHNICAL REPORT 1, JUNE 1964-31 MAY 1965. Contract Nonr 4605(00), BBN Rep. 1287, Sept. 1965, 66pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Man-Machine Information Div., Bolt Beranek & Newman Inc., Cambridge, Mass.).

This report suggests that simultaneous measurement, recording, and reporting of many, rather than 1, criteria of performance for step tracking and discrete setting tasks will increase both the present and the future value of an experiment. An illustrative example is given from the literature on servo-analysis as well as 1 from the human factors literature. Questions are raised as to the validity of extrapolation from a tracking experiment in which 1 criterion is used to a system where another would be more appropriate. A digital computer program for the "simultaneous" computation of a number of measures of step tracking performance was devised and applied to a typical experiment on step tracking. The results indicate that, as expected, different combinations of gain and lag are "optimum" for different criteria (where optimum means producing the least value of the criterion) and that therefore research aimed at solutions of operational problems should employ a variety of measures of performance.

R 4

26,327

Oberman, A., Lane, N.E., Mitchell, R.E. & Graybiel, A. THE THOUSAND AVIATOR STUDY. DISTRIBUTION AND INTERCORRELATIONS OF SELECTED VARIABLES. Contract NASA Order R 136, Monograph 12, Sept. 1965, 216pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

The 1963-1965 evaluation in the Pensacola Thousand Aviator Study was the third follow-up examination in a longitudinal study of 1056 Naval aviators. The original study was carried out in 1940, and subsequent examinations were performed in 1951 and 1957. During the 1963 examination, a large body of physiological, psychological, and personal history data was collected on 675 surviving members of the original population. Because of the magnitude and diversity of this information, an over-all view of distributions and interrelationships seems necessary for a) providing assistance in understanding the findings of the study, and b) indicating possible areas of further research by facilitating the discovery of relationships not otherwise apparent. This report describes in detail the distributions and intercorrelations of 100 variables selected from the measures obtained during the 1963 follow-up examination. Data are presented in the form of descriptive statistics, frequency histograms, and Pearson correlation coefficients. Comments deal exclusively with statistical considerations, and no interpretations are attempted.

R 21

26,328

Oberman, A., Mitchell, R.E. & Graybiel, A. THOUSAND AVIATOR STUDY: METHODOLOGY. Contract NASA Order R 136, Monograph 11, July 1965, 151pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

The Pensacola study of Naval Aviators, commonly termed the "Thousand Aviator Study," began in July 1940 as a survey to validate techniques for pre-selecting pilot trainees in order to reduce the large attrition rate in the flight training program at that time. From this original exploratory study of pilot selection evolved a longitudinal study which has provided continuous physiologic information on a group of healthy males from youth to senescence. Re-examinations have been made on survivors of the group in 1951, 1957, and 1963. This Monograph purports to accomplish the following aims: a) Present and unify the procedures and methods of all the examinations carried out on the group; b) offer standard material for cooperative studies; c) serve as a guide for future evaluations; d) display the methodology employed in a fashion which lends itself to perusal by critical reviewers; e) suggest by retro-spection necessary modifications; and f) provide a basis for scrutinizing the material in search of new avenues of investigation. The material falls into the natural division of the 4 different examinations carried out to date, each chapter containing data regarding procedures and tests of a particular study. No findings of any of the evaluations are presented; for these the reader is referred to the Thousand Aviator Study Bibliography.

R 64

26,329

Graybiel, A., Schuknecht, H.F., Fregly, A.R., Miller, E.F., II, et al. PRACTICAL AND THEORETICAL IMPLICATIONS BASED ON LONG-TERM FOLLOW-UP OF MENIERE'S PATIENTS TREATED WITH STREPTOMYCIN SULFATE. Contract NASA Order R 93, Proj. MR 005.13 6001, Subtask 1, NAMI 948, Rep. 123, Oct. 1965, 22pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

4 patients who had received streptomycin sulfate in the treatment of Meniere's disease were evaluated in terms of the long-range effects of therapy and utilized as experimental Ss. None had experienced a return of symptoms over the entire follow-up period which ranged from 11 to 13 yrs. There was residual tinnitus, and deafness ascribable to the disease and ataxia ascribable to toxic effects of the drug as well as the disease. In the 3 Ss who had 1 normal ear each, there was no effect of the streptomycin on the hearing in that ear but considerable suppression of semicircular canal function with some recovery. In all of the 5 diseased ears there was a slight significant improvement in hearing (later lost in one) but great suppression of semicircular canal function with little recovery. Otolith function, as measured by ocular counterrolling, was within the normal range in 2 Ss and greatly suppressed in 2. Although tests were not carried out prior to therapy, it was believed that the suppression was due more to disease than the drug. When exposed to bizarre stimulation of the semicircular canals in the SRR none were susceptible to canal (motion) sickness, but the 3 with unilateral disease perceived the Coriolis illusion. The findings utilizing a new ataxia test battery were similar to those obtained in persons with complete loss of vestibular function. Inasmuch as the greatly differing degrees of otolith function bore no relation to these test results, they were ascribed mainly to loss of canal function.

R 20

26,330

Bergman, W. THE EFFECT OF MICRO WAVES ON THE CENTRAL NERVOUS SYSTEM. ca. 1965, 78pp., Research & Scientific Lab., Ford Motor Company, Detroit, Mich. (Transl. from: German).

The autonomic nervous system is affected by the microwaves of the cm wave length band. These waves affect circulation, respiration, temperature control, water balance, albumin and sugar concentration in the cerebro-spinal fluid, hydrogen ion concentration, EEG, GSR, sleep, conscious awareness, etc. Depending on the applied dosage, these waves stimulate the sympathetic or parasympathetic system. Very small dosages produce analgesic effects; however, very large dosages are fatal. An undamped or modulated frequency is more effective than damped waves. The biological effect of these waves results from the resonance absorption in the ganglia. There are indications that only higher harmonics, and not the fundamental frequency, produce biological effects. The shielding of the test S by metal screens increases these effects; however, magnetic fields remove them. Higher harmonics producing these biological effects have physical properties which are similar to those of the bio-electrical energy generated by the human body. The mechanism of hypnosis is explained by the transmission of this energy.

R 111

26,331

Wierwille, W.W. & Gagne, G.A. A THEORY FOR THE OPTIMAL DETERMINISTIC CHARACTERIZATION OF THE TIME-VARYING DYNAMICS OF THE HUMAN OPERATOR. Contract NAS 1 3485, NASA CR 170, Feb. 1965, 66pp. National Aeronautics and Space Administration, Washington, D.C. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

A deterministic theory of characterization is presented which can be used to determine the time-varying dynamics of the human operator engaged in a tracking task. With this theory it is possible to obtain a time-varying impulse response and a time-varying transfer function which represent the action of a human operator in an open- or closed-loop control system. No special form of input is required. The characterization, which may be developed for either real-time or non-real-time computation, is based upon an exact theory of fixed-form optimization. A strongly convergent, definitely stable, iteration technique can be used to realize the optimal characterization filter. The theory takes the time-variation of the impulse response or transfer function into account, so that it is unnecessary to make the assumption of slowly varying dynamics. An uncertainty or compromise is shown to exist between the error (that is, the error between the output of the human operator and that of the optimal characterizing filter) and the degree of time-variability of the optimal characterizing filter. This uncertainty appears to be fundamental, and cannot be circumvented. A number of experiments which verify and make use of the theory are presented. Known time-varying networks can be accurately characterized, and changes in the tracking transfer characteristic of the human operator can be detected.

R 17

26,332

Glenn, W.G., Prather, W.E. & Jaeger, H.A. TELUS (TELEMETRIC UNIVERSAL SENSOR). Task 775402, SAM TR 65 1, May 1965, 7pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

There was need for a flexible complex of receiving and evaluating instruments for sensing physiologic and biologic analyses performed remotely by various field transducers. This need has been met by the design and development of TELUS (Telemetric Universal Sensor), a 1-man laboratory console capable of receiving, quantitating, comparing, coding, storing, searching, retrieving, and distributing electromagnetic data. These data are received and distributed by radio and telephone. Field tests of TELUS indicate good performance characteristics for evaluating 4 channels of telemetered data and providing 2-way communication between the laboratory and remote testing areas.

R 6

26,333

Plag, J.A. & Arthur, R.J. PSYCHIATRIC RE-EXAMINATION OF UNSUITABLE NAVAL RECRUITS: A TWO-YEAR FOLLOW-UP. Amer. J. Psychiatry, Nov. 1965, 122(5), 534-541. (USN Medical Neuropsychiatric Research Unit, San Diego, Calif.). (Reprint) (AD 628754)

In 1960 & 1961, of 216 recruits adjudged unsuitable by aptitude boards at 2 naval recruit training commands, 134 were deliberately graduated from training in order to assess their adjustment in the fleet. 2 yrs. subsequent to graduation, 97 of these sailors were still on active duty in the Navy and their over-all adjustments, evaluated on the basis of psychiatric follow-up examinations, were not demonstrably different from those of a matched control group. It is suggested that the unexpected high rate of fleet retention among enlistees judged to be unsuitable as recruits occurred because: a) many Ss were able to achieve emotional growth and maturity in the supportive and stable environment of the military, despite their pathological backgrounds; b) the fleet was able to utilize the services of some marginally performing enlistees, at least during the first several years of their enlistments; and c) initial training and adjustment problems were, for some youths, merely transitory.

R 17

26,334

Gershuni, G.V. INVESTIGATION OF THE NEUROPHYSIOLOGICAL MECHANISMS IN THE PROCESS OF EXTERNAL SIGNAL DISCRIMINATION. Report from: "Tenth Congress of the I.P. Pavlov All-Union Physiological Society, Yerevan, Russia, October 22-28, 1964." NASA TT F 307, Jan. 1965, 5pp. National Aeronautics & Space Administration, Washington, D.C.

The effect of the duration of a signal consisting of broadband noise on human and animal discrimination was studied. Discrimination was measured by psychophysical methods, by conditioned reflex methods, by electrical recording from the auditory cortex, and by recording from single cells in the cochlear nucleus. The results suggested 3 time boundaries which affect the process of discrimination. The 1st, with an upper limit of 10-20 msec, shows little effect of duration on the relation between signal intensity and the measures of discrimination. The 2nd, from 10-20 to 80-100 msec, has the characteristic reciprocal intensity-duration relationship. The 3rd, above 100 msec, again shows no effect of signal duration on discrimination involving signal intensity. The results are interpreted in terms of short-term memory and evolutionary development.

26,335

Hertzman, A.B., Flath, F., Coleman, B. & D'Agrosa, L.S. CONTINUOUS REGISTRATION OF BODY WEIGHT. FINAL REPORT MAY 1963-SEPTEMBER 1964. Contract AF 33(657) 11551, Proj. 7222, Task 722204, AMRL TR 65 23, June 1965, 9pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Physiology Dept., St. Louis University School of Medicine, St. Louis, Mo.).

This report describes a device for continuous recording of the weight of a human S. The frame on which the S may either sit or lie is carried by 3 load cells mounted as a tripod. The electrical signals from the strain-gauges permit detection of a weight change of 1 gram. Insulation and heating of the load cells to a constant temperature  $\pm 0.1^\circ\text{C}$  permit use of the system in the presence of rapid changes in environmental temperatures. Circuits are described for automatic regulation of load cell temperature.

R 4

26,336

Simons, D.G. & Johnson, R.L. HEART RATE PATTERNS OBSERVED IN MEDICAL MONITORING. Task 775506, SAM TR 65 26, May 1965, 15pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Aerospace Med., June 1965, 36(6), 504-513).

The study included heart rate records from several hundred individuals under a wide variety of aerospace flight stress situations including sleep, quiet wakefulness, clinical stress testing, simulated aircraft flight, and F-100 aircraft flight. Automated beat-by-beat heart rate analysis recorded at 1 mm. per sec. paper speed clearly demonstrated a variety of heart rate patterns. Base heart rate values which reflected homeostatic levels were distinguished from heart rate reflex activity identified as transient disruptions of homeostasis. Reflex patterns were divided into respiratory heart rate and slow wave heart rate reflex activity. 3 forms of slow waves were identified: cardioaccelerator, balanced, and cardiodecelerator. The discussion included physiologic mechanisms contributing to the observed heart rate reflex patterns.

R 23

26,337

Ervin, F.R. RESEARCH ON INFORMATION PROCESSING IN THE CENTRAL NERVOUS SYSTEM. Contract AF 19(628)408, Proj. 5632, Task 563208, AFRL 65 580, Sci. Rep. 1, July 1965, 22pp. USAF Cambridge Research Labs., Bedford, Mass. (Stanley Cobb Labs., Massachusetts General Hospital, Boston, Mass.).

A new method of automatic receptive field plotting using a general purpose computer and a digital CRT display is described. The technique enables one: a) to display 1-80 points in reproducible coordinates on a number of independent timing systems and to change the stimulus location or pattern successively in a programmed sequence; b) to build up a post-stimulus time histogram of unitary response (or other desired function) and of the averaged slow potential for each stimulus parameter, then to store the data in a permanent form; c) to read in the data, display it on CRT and after "labelling" by the experimenter, to print out a table of the values of interest from a series of successive data blocks; and finally d) to produce a reliable quantitative picture of the responses for analysis of receptive field organization, the analysis of response to patterned stimuli, and for comparison of the responses of a unit under different experimental conditions.

R 10

26,338

Hammel, H.T. NEURONES AND TEMPERATURE REGULATION. FINAL REPORT MARCH 1963-MARCH 1965. Contract AF 33(657) 11103, Proj. 7164, Task 716409, AMRL TR 65 232, Dec. 1965, 37pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (John B. Pierce Foundation Laboratory, New Haven, Conn.).

An attempt has been made to ascribe the regulation of body temperature in the homeotherms to the hypothalamus and the preoptic region. Results of measurements of hypothalamic temperature and regulatory responses in the normal dog in hot, neutral and cold environments and, at various times, in the resting, waking, sleeping, exercising and febrile state, are interpreted on the assumption that the hypothalamus responds to changes in its own temperature like a proportional controller with an adjustable set point. For each thermal regulatory response, the response was as if its magnitude were proportional to the deviation of the actual hypothalamic temperature from a set point temperature, and as if the set point temperature were to increase in the cold environment, decrease in the hot environment, decrease at the onset of sleep, decrease at the onset of exercise and increase in fever. A model based on known characteristics of neurones is proposed which appears to function like a proportional controller with an adjustable set point.

R 13



26,339

Verdi, A.P., Ornstein, G.N., Heydorn, R.P. & Frost, G. EFFECTS OF DISPLAY QUICKENING ON HUMAN TRANSFER FUNCTIONS DURING A DUAL-AXIS COMPENSATORY TRACKING TASK. FINAL REPORT MAY 1963-JUNE 1964. Contract AF 33(657) 11102, Proj. 7134, Task 718402, AMRL TR 65 174, Nov. 1965, 207 pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (North American Aviation Inc., Columbus, Ohio).

This research was concerned with the human's behavior in adapting his response mode to variations of certain conditions of a compensatory tracking task. The task conditions evaluated were quickening level, system gain, task load, and task complexity. The results of the studies show good agreement with the transfer function "adjustment rules" developed by other investigators. When quickening is introduced, the human adjusts his transfer function in a systematic and predictable manner in response to variations of the quickening level. As the amount of quickening increases the operator increases gain and lag but decreases lead -- going from a lead-lag form of transfer function for no quickening to a lag form for full quickening. The human adjusts his equalizing parameters to achieve stable loop performance for all quickening levels. Man's ability to reduce the system error is significantly affected by the distribution of gains in the overall man-machine system. The human's transfer function for single and dual task load conditions probably differs. Tracking error was found to be least when the quickening level used in the second axis is identical to that in the axis of primary interest; error increased as the quickening levels for the two axes became more dissimilar. Display error scoring yielded an order of merit for quickening levels that was directly contradictory to that obtained with system error scoring. System error was greater for a quickened system than for an unquickened system. This finding provides strong support of the need for an antibias network in many applications of display quickening to vehicle control problems.

R 25

26,340

Frankenhaeuser, Marianne, Froberg, Jan, Hagdahl, Ragnar, Rissler, Anita, et al. PHYSIOLOGICAL, BEHAVIORAL, AND SUBJECTIVE INDICES OF ACTIVATION IN HABITUATION EXPERIMENTS. Number 187, March 1965, 18pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The level of activation was manipulated in 15 Ss by exposing them repeatedly to an audio-visual conflict test. Objective performance, subjective reactions, tissue conductance, and catecholamine excretion were examined. The general characteristic of the data was a progressive decrease in physiological and subjective indices of activation as performance improved. Special attention is paid to quantitative relations between the different variables in the course of habituation to the stressor.

R 33

26,341

Kinkade, R.G., Kidd, J.S. & Ranc, M.P. A STUDY OF TACTICAL DECISION MAKING BEHAVIOR. FINAL REPORT NOVEMBER 1964-NOVEMBER 1965. Contract AF 19(628) 4752, ESD TR 66 61, Nov. 1965, 71pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Aircraft Armaments, Inc., Cockeysville, Md.).

A study program was conducted to investigate tactical decision making behavior. One aspect of the program involved defining a conceptual view of tactical decision making behavior. The other aspect of the program consisted of performing 5 experiments related to the conceptual view. The conceptual view is not uniquely different from existing views. It represents a combination of concepts which have been described by other people. The view provides a framework for categorizing research findings and investigating the operations of a command post. The experiments concerned investigating the effect of feedback factors, situation factors and task factors on tactical decision making performance. An artificial task, placed in an Air Defense context, was used as a research vehicle in these experiments. The results of the experiments have implications for training tactical decision makers and for designing command-control systems.

R 37

26,342

Holesko, N.M. (Ed.). A COLLECTION OF PAPERS ON SPACE SUITS AND HUMAN PERFORMANCE. REL HFG 65 1, Aug. 1965, 131pp. Space Div., Chrysler Corporation, New Orleans, La. (AD 476659)

This collection of papers stems from a symposium on space suits and human performance presented by the Society of Engineering Psychologists at the American Psychological Association Annual Convention in Los Angeles, California, on September 6, 1964. The articles presented in this volume include papers presented by the participants at the symposium (articles 2, 3, 6, & 7) (c.f. HEIAS 26,344, 26,345, 26,348, 26,349, respectively), editorialized transcriptions of some discussions at the subject symposium (articles 10 & 11) (c.f. HEIAS 26,352 & 26,353), and additional papers relevant to space suits and human performance which were subsequently submitted to the editor for inclusion in this volume (articles 1, 4, 5, 8, & 9) (c.f. HEIAS 26,343, 26,346, 26,347, 26,350, 26,351, respectively). The arrangement of this volume has been organized in the following manner. Article 1 depicts various safety hazards on the lunar surface and in free space that relate to space suit design. Articles 2 & 3 discuss aspects of performance when space suits are worn in a zero-g gravitational field produced during Keplerian trajectory aircraft flights. Articles 4 & 5 discuss the simulation of zero-g effects by water immersion techniques, while article 6 discusses the zero-g field as created by suspension devices. Article 7 refers to zero-g effects on performance without particular reference to the means for generating the zero-g field. Article 8 presents an experimental investigation of the physiological effects of donning a space suit in a one-g environment. Article 9 reviews work and thermal loads placed upon men working in space suits. Articles 10 & 11 contain editorialized transcriptions of discussions at the space suits and human performance symposium.

26,343

Goodman, J.R. & Radnofsky, M.I. LUNAR SURFACE AND FREE SPACE HAZARDS RELATING TO SUIT DESIGN. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 1, 1-24. Space Div., Chrysler Corporation, New Orleans, La. (Manned Spacecraft Center, NASA, Houston, Tex.). (Report from: "Human Factors Session, 1965 Annual Institute of Environmental Sciences Technical Meeting, April 22, 1965"). (AD 476659)

This article describes the anticipated lunar environmental conditions, how man fits into and is affected by them, and how the Apollo Extravehicular Mobility Unit (EMU) is designed to allow man to perform under lunar conditions. The effects of atmospheric pressure, the metabolic effects of lunar terrain, the simulation of lunar surfaces, the thermal environment, the meteoroid environment and visual problems are discussed. (HEIAS)

26,344

Sasaki, E.H. ZERO-G STUDIES AND PRESSURE SUITS. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 2, 1-24. Space Div., Chrysler Corporation, New Orleans, La. (USAF 6570th Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio). (AD 476659)

The results of these zero-gravity test programs indicated that a man, wearing an inflated full-pressure suit, could adequately complete most tasks assigned him. To complete these tasks, he usually required more time than he would need if he were in a one-g shirtsleeve environment. However, the encumbrance of the pressure suit, which severely restricted mobility and limited kinesthetic feedback, contributed more to this decrement in performance than did the weightless environment. Although with practice, a helpful learning process is experienced in working in a pressure suit, it is imperative that the design of pressure suits be improved so that human performance in space systems can be optimized.

26,345

Seeman, J.S., Smith, F.H. & Mueller, D.D. PRELIMINARY INVESTIGATIONS OF SPACE MAINTENANCE. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 3, 1-22. Space Div., Chrysler Corporation, New Orleans, La. (Marshall Space Flight Center, NASA, Huntsville, Ala.). (AD 476659)

This paper reports the results of a series of preliminary studies performed at the George C. Marshall Space Flight Center, Huntsville, Alabama, and at Wright-Patterson Air Force Base, Ohio. The major conclusions based upon the research are that: a) Assuming appropriate training under one-g conditions and the use of a tethering system similar to the one described, it appears unnecessary to simulate zero-gravity conditions in order to study space maintenance performance of the type described; b) The greatest contributing factor to performance decrement in space maintenance activity is space suit pressurization level. This holds true apparently under both gravitational conditions involved in this study. Performance decrement here is defined as an increase in time required to accomplish a given psychomotor task; c) We have presented a scheme which can serve as a basis for future research comparing performance on 3 psychomotor tasks relating percentage increase in performance time to pressure suit pressurization. This may be a way to conserve funds and time in quantitatively evaluating pressure suit mobility; d) No data are available from this study on the effects upon performance of prolonged weightlessness. Conceivably, such an environment, through its asthenic effects, could introduce other constraints on human performance. Hopefully, such questions can be dealt with on projects which permit continuous long-term exposure of personnel to orbital flights.

R 1

26,346

Pierce, B.F., Wolf, R.L. & Casco, E.L. THE USE OF SPACE SUITS IN WATER IMMERSION STUDIES. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 4, 1-6. Space Div., Chrysler Corporation, New Orleans, La. (Life Sciences Sec., General Dynamics/Convair, San Diego, Calif.). (AD 476659)

Since weightlessness represents one of the most important aspects of the outer space environment to which man will be subjected, and since it is precisely this condition that is the most difficult to duplicate in earth-bound laboratories, every technique for simulating its effects is worthy of serious consideration. Water immersion has been demonstrated as being a satisfactory method of simulating various physical effects of zero gravity. It has disadvantages compared to such techniques as air bearing devices or parabolic flights in aircraft. Thus the hydrodynamic drag forces of water affect the acceleration and velocity of moving bodies differently than does a frictionless environment, although there are methods of minimizing this difference. However, water immersion has the advantages of being relatively simple and inexpensive, and of being minimally restrictive in volumetric and time-duration considerations. Since the space suit will be an influential element in the space environment, and since the suit-man unit will be affected by weightlessness, it is imperative to include the suit in any tests representing conditions in which it would normally be worn. With techniques now available, underwater space-suit operations have already provided the answer to practical, manned-space-vehicle design problems. The procedures and equipment currently under development are intended to increase the efficacy of the weightless-simulation-by-water-immersion technique as well as to broaden its applications.

R 3

26,347

Schuster, D.H. EVALUATION OF REPLACEMENT TIMES OF SPACECRAFT RADIOS UNDER SIMULATED WEIGHTLESSNESS. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 5, 1-15. Space Div., Chrysler Corporation, New Orleans, La. (Process Development Div., Collins Radio Company, Cedar Rapids, Iowa). (AD 476659)

This study evaluated the mechanical aspects of maintenance to be expected for 2 prototype radios for spacecraft communications systems. 2 environmental extremes were selected; the better condition had Ss working on dry land without gloves. The worse condition had scuba Ss working under water with gloves on neutrally buoyant radio mockups as a weightless simulation of space conditions. 5 variables were used in an analysis of variance design; these were: environment (dry land vs underwater), radio unit (SHF Pseudo Random Noise Amplifier vs VHF AM Transceiver), activity phase (removal vs replacement), replications (2 blocks of trials) and Ss (4 experienced scuba divers). There were 3 significant main effects: environment, unit and replications. There were also 3 significant 2-way interaction effects, but of these, the only one with any practical significance was between environment and radio unit. On dry land, the VHF unit took 530 sec to remove and replace, while underwater, the figure was 1009 sec. In contrast, the SHF unit took 375 sec on dry land and 644 sec underwater. It is to be noted that the main effects of environment and unit were considerably more important than this significant interaction. Underwater times were about double the dry land times. A significant practice effect was found; Ss took an average of 741 sec in the first block of trials and 538 sec for complete removal and replacement in the second block (replication). 2 multiple regression analyses were done; the multiple correlation coefficient R in the nonlinear case was a surprisingly high 0.873, in predicting maintenance time.

26,348

Hanff, G.E. SHIRTSLEEVE-SPACE SUIT EFFECTS ON HUMAN PERFORMANCE. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 6, 1-11. Space Div., Chrysler Corporation, New Orleans, La. (Human Engineering & Maintenance Design Dept., Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.). (AD 476659)

This discussion is predominantly a historical summary of experience at Lockheed-California Company in determining the effects on man's performance of a fully pressurized "space" suit, especially in combination with a frictionless environment typical of unpowered space flight.

26,349

Streimer, I. THE EFFECT OF REDUCED GRAVITY AND PRESSURE SUITS UPON OPERATOR CAPABILITY. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 7, 1-6. Space Div., Chrysler Corporation, New Orleans, La. (Psychology Dept., San Fernando Valley State College, Northridge, Calif.). (AD 476659)

This paper has presented and reviewed a body of data which makes suspect many of the currently accepted concepts of system sizing. The intent of the paper has been to demonstrate that no realistic assessment of many of the elements of system design and aspects of system capability can be realized until the capabilities and requirements of the space worker are established.

R 20

26,350

Hendler, E., Dery, D.W. & Miller, N. PHYSIOLOGICAL COST OF DONNING A FULL PRESSURE SUIT. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 8, 1-20. Space Div., Chrysler Corporation, New Orleans, La. (USN Air Engineering Center, Aerospace Crew Equipment Lab., Philadelphia, Penn.). (AD 476659)

Experienced Ss expended approximately 1 kcal of energy per kg of body weight in donning the U.S. Navy MK-4 full pressure suit under the test conditions. Donning volumes as small as about 7 times the volume of the S's body accommodated the dressing procedure with no apparent increases in donning time nor in energy expenditure. Suit fit had an important effect on both effort and time required for donning.

R 12

26,351

Roth, H.P. WORK AND THERMAL LOADS ON MEN WORKING IN SPACE SUITS. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 9, 1-10. Space Div., Chrysler Corporation, New Orleans, La. (Manhattan Beach, Calif.). (AD 476659)

Some of the obvious conclusions based on an analysis of available data on work and thermal loads on men working in space suits are: a) The space suit in its present state of development constitutes a major obstacle to efficient or even acceptable performance of physical tasks and activities by astronauts on the lunar surface; b) Improvement in mobility under pressurized conditions, and in removal of metabolic heat from the man, are urgently needed. Marked improvement in the former would help reduce the degree of criticality of the latter, by reducing heat production for given kinds of activity; c) Choice of promising lines of development, and evaluation of progress, would be aided by testing programs which will yield much more information than is now available on actual metabolic heat production rates by men performing various physical activities in pressurized suits; d) We know little enough about metabolic rates in suits, for work under normal-gravity conditions. We know practically nothing about what they will be under zero- or reduced-gravity conditions. Such information should be obtained as soon as possible through experiments conducted under conditions which will simulate reduced-gravity as faithfully as possible; e) It is vital that procedures for evaluation of the effects of suit pressurization on metabolic heat production, while working, be better standardized, to enable better comparison of results from various laboratories; f) Information should be freely circulated among workers in this field. This is a difficult area of biomechanical and physiological research and testing. The rapid progress that must be made in this field can be assured only by a policy of open, rather than restricted flow of information. Astronauts deserve suits which will aid rather than hamper them.

R 4

26,352

Roebuck, J.A. TRANSCRIPTION OF DISCUSSION AT SYMPOSIUM ON SPACE SUITS AND HUMAN PERFORMANCE. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 10, pl. Space Div., Chrysler Corporation, New Orleans, La. (Space & Information Systems Div., North American Aviation, Inc., Downey, Calif.). (AD 476659)

Brief remarks are made on the papers of the symposium and work on notation systems for describing angular positions of man's limbs and motions. (HEIAS)

26,353

Schwartz, S. TRANSCRIPTION OF DISCUSSION AT SYMPOSIUM ON SPACE SUITS AND HUMAN PERFORMANCE. Chapter from: "A Collection of Papers on Space Suits and Human Performance." REL HFG 65 1, Aug. 1965, Article 11, pl. Space Div., Chrysler Corporation, New Orleans, La. (Grumman Aircraft Engineering Corporation, Bethpage, N.Y.). (AD 476659)

There are several factors that work to our advantage in the lunar project. One factor we can depend on is the excellent skill, physical condition and efficiency of the astronauts. A second factor, which is very interesting, is that the zero-gravity space environment aids us in mobility in most instances. We found in the lunar excursion module (LEM), many tests requiring mobility for climbing in and out of the module and through passageways are impossible tasks in the present pressurized suit at earth gravity. Under simulated and actual KC-135 flight 1/6 (simulated lunar) gravity, and under test zero-gravity, not only were the test Ss able to perform these tasks, but performed them quickly and efficiently. Under 1/6 gravity you can literally move by the tips of your toes and with your finger tips with very little gross movement or strength. One actually has many novel modes of locomotion such as soaring plus a full bag of other tricks. It is hoped that learning to walk on surfaces (spacecraft or lunar) under 1/6 gravity and zero-gravity will be rapid particularly with agile and athletic astronauts who have been properly trained.

26,354

Parker, J.F., Jr., Reilly, R.E., Dillon, R.F., Andrews, T.G., et al. DEVELOPMENT OF TESTS FOR MEASUREMENT OF PRIMARY PERCEPTUAL-MOTOR PERFORMANCE. Contract NAS 9 2542, NASA CR 335, Dec. 1965, 198 pp. National Aeronautics & Space Administration, Washington, D.C. (Biotechnology, Inc., Arlington, Va.).

The purpose of this project was to develop a prototype battery of tests suitable for measuring the primary dimensions of perceptual-motor performance. An extensive survey was made of the technical literature concerning perceptual-motor performance, with particular attention given to factor analytic investigations. Based on results of this survey and a consideration of the kinds of activities likely to be required of crewmen in space vehicles, 18 basic perceptual-motor abilities were identified as important. An integrated console was developed which would provide separate measures for each of these performance dimensions. Tests such as these will be of value in assessing the influence of the space environment on human performance.

R 21

26,355

Russell, R.W. & Stern, R.M. GASTRIC MOTILITY: THE ELECTROGASTROGRAM. TECHNICAL REPORT. Contracts DA 49 193 MD 2063 & Nonr 908 15, April 1965, 35pp. Indiana University, Bloomington, Ind.

The authors described a method for recording gastric motility, the EGG, in the intact organism. The method is based upon detection of the substantial potentials generated by the stomach through electrodes placed on the skin of the abdomen. They also described methods for analyzing the records and have presented evidence for the validity of the EGG as a measure of gastric motility. The discussion is couched primarily in terms of employing the method for research purposes. They conclude by calling attention to the fact that the EGG also has applications as a clinical tool in studying disorders of gastric motility and in following the progress of therapy.

R 45

26,356

Iberall, A.S. & Cardon, S.Z. ANALYSIS OF THE DYNAMIC SYSTEMS RESPONSE OF SOME INTERNAL HUMAN SYSTEMS. Contract NASw 1066, NASA CR 141, Jan. 1965, 109pp. National Aeronautics and Space Administration, Washington, D.C. (General Technical Services, Inc., Cleveland, Ohio).

The first section of this report is concerned with furthering a phenomenological description of temperature regulation in the human. The dynamics of the cardiovascular pressure and flow system is analyzed in a second section of the report. This is followed by a discussion of the hormonal system--its chemical properties, biological action, and mechanisms of activity. A final section of the report is devoted to the behavioral system. (HEIAS)

R 92

26,357

West, A. MICROBIOLOGICAL SAMPLING FOR HUMAN SUBJECTS. FINAL REPORT. Proj. 7164, Task 716410, AMRL TR 65 192, Dec. 1965, 19pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

The restricted environment of a space vehicle and the stresses of space flight have made necessary the establishment of microbiologic tolerance limits. A primary portion of that effort was to determine the relationship of man's indigenous microflora to his general physiologic status and the methods to maintain the requisite degree of microbial control (i.e., personal hygiene and sanitation requirements). The first phase of microbiological studies consists of identifying the quantitative and qualitative composition of the indigenous flora and delineating those factors that influence the population dynamics of this microflora. For this purpose, Ss can be confined in space system simulators and exposed to controlled environmental conditions. This report provides a basic guideline for sampling to establish a microbial profile for Ss or astronauts in a simulated space vehicle environment. It includes some of the accepted methods of sampling and identification and is designed with flexibility to allow the modifications of personal preference and the incorporation of more sophisticated methods, if required. The frequency of sampling and the appropriate body areas to be sampled can only be determined by experience and the amount and kind of the information required. The population dynamics of the indigenous microflora, the host-parasite relationship, and various environmental constraints should be considered in the selection of body areas to be studied. The guides for sampling are presented as charts, showing the procedures for the eye, ear, nose, throat, mouth, skin, feet, head, urine, and stool.

R 10

26,358

Eliason, D.W. AN EXPERIMENTAL STUDY OF MANUAL CONTROL DURING TERMINAL RENDEZVOUS UNDER ADVERSE CONDITIONS. Rep. 6 65 65 1, Feb. 1965, 24pp. Missiles & Space Company, Lockheed Aircraft Corporation, Sunnyvale, Calif. (AD 612777)

Human performance was measured in an orbital rendezvous task under adverse conditions; e.g., thrust misalignments. An experiment was carried out using 4 Ss, a control-display cockpit simulator, and a 6° of freedom analog computer mechanization. 2 thrust configurations (single vs multiple engine) were studied and compared using performance criteria of fuel consumption and final errors in relative velocity and vehicle orientation. The single-axis attitude-thrust (single engine) configuration was superior with respect to fuel consumption. The 3-axis orthogonal-thrust (multiple engine) configuration exhibited higher reliability and smaller final errors in relative velocity and orientation.

R 3

26,359

Alexander, M. & Clauser, C.E. ANTHROPOMETRY OF COMMON WORKING POSITIONS. FINAL REPORT JULY 1961-JULY 1962. Proj. 7184, Task 718408, AMRL TR 65 73, Dec. 1965, 29 pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio

26 dimensions of the human body in various working positions (standing, bending, kneeling, squatting, supine, and sitting) were obtained by photography or by direct measurement. The purpose of this study was to provide the human engineer with anthropometric data of various missile worker's positions so that more adequate work stations can be designed. Each dimension is defined verbally and graphically; and the 5th, 25th, 50th, 75th, & 95th percentiles and other statistical data are presented.

R 9

26,360

Berman, M.B. A BIOMECHANICAL INVESTIGATION OF STATIC PULL WITH CONSTANT SHOULDER TORQUES. (M.S. Thesis presented, Faculty of Texas Technological College, Lubbock, Tex.). May 1965, 117pp. Engineering School, Texas Technological College, Lubbock, Tex. (AD 617289)

The purpose of this investigation was to study the effects of constant shoulder torques, while a S exerted static pull, on 2 selected physiological functions: ventilation rate and pulse rate. The height of the shoulder below the lever arm and angle of the elbow were varied in conjunction with different levels of constant torque. Ventilation proved to be responsive to constant shoulder torques, while pulse rate was found to be insensitive to light and medium loads. Within the limits of this investigation the most efficient operator position is in the vicinity of 100° of elbow flexion and between 10 to 15 in. of shoulder height below the lever.

R 17

26,361

Lippert, S. ESTIMATED BODY DIMENSIONS OF THE ADULT MALE JEWISH POPULATION OF ISRAEL. TAE Report 40, June 1965, 63pp. Aeronautical Engineering Dept., Israel Institute of Technology, Haifa, Israel.

The weight, stature and sitting height obtained on a sample of > 10,000 adult male Jewish Israelis 40 yrs. of age and over is reported. The dimensional information was gathered as part of a long-range research project on ischemic heart disease being conducted cooperatively by the Hadassah Medical organization, the Ministry of Health of Israel and the National Heart Institute of the United States Public Health Service. The data were made available to the Technion for human engineering applications. The basic information is restructured for a more representative age and region-of-origin sampling and compared to dimensional data in the literature on other populations. The dimensional estimates are projected to the yr. 1970, and a schedule of dimensions suitable for design applications is proposed.

R 19

26,362

Iliyanok, V.A. & Samsonova, V.G. THE EFFECT OF PULSATING LIGHT SOURCES ON THE ELECTRICAL ACTIVITY OF THE HUMAN BRAIN. RSIC 298, Feb. 1965, 10pp. USA Missile Command, Redstone Scientific Information Center, Redstone Arsenal, Ala. (Transl: Svetotekhnika USSR, 1963, 5(1), 1-5). (AD 611773)

The spectrum of the EEG was studied for a wide range of frequencies at various intensities and durations of rhythmic light flashes as well as during the simultaneous action of 2 or more light rhythms differing in frequencies and at various depths of the luminous flux pulsations. Experiments were conducted by means of a photostimulator which provided a practically rectangular form of light impulses with frequencies ranging from 3 to 240 cps. Exposure of the pupil to the screen viewed at an angle of 95°, varied from 0.08 to 250 lux, and light stimulations lasted 50 sec. EEGs from the occipital region of 120 healthy adults (18 to 30 yrs.) were recorded and analyzed. From the results the following conclusions were drawn: when luminescent lamps with a frequency of 100 cps are switched on, it is desirable to use an arrangement in which depths of pulsations do not exceed 5-8%; during pulsation frequencies of 300 cps and higher in the light flow, the depth of pulsations is of no consequence since the human brain is not responsive to such a frequency; experiments on the changes in the durations of light flashes illustrate the expediency of using long-lag luminophors in luminescent lamps. (HEIAS)

R 12

26,363

Jouvet, M. PARADOXICAL SLEEP - A STUDY OF ITS NATURE AND MECHANISMS. Progress in Brain Research, 1965, 18, 20-62. (Laboratoire de Pathologie Generale et Experimentale, Faculte de Medicine, Lyon, France). (Reprint) (AD 629202)

In the first part of this study, the arguments supporting the theory of the duality of sleep (slow sleep-paradoxical sleep) are set forth. Some of these arguments are as follows: a) Both tonic and phasic EEG or peripheral index of P.S. are totally different from EEG and behavioral slow sleep. The pontine origin of rapid eye movements and of the phasic pontogeniculo-occipital activity occurring during P.S. is emphasized; b) The results of selective deprivation of P.S. in the adult animal are summarized. They show that after deprivation for more than 72 hrs, a maximum of 60% of P.S. is reached during recuperative sleep. This percentage is not exceeded even after 17 days of deprivation. On the other hand, during recuperation P.S. may be observed immediately after waking. After prolonged deprivation several days are required before the animal recovers the control level of P.S.; c) Coagulation of the pons may suppress P.S. electively without producing any change in slow sleep. These results cannot be explained by a unitary theory of sleep. On the contrary, they allow us to differentiate P.S. from slow sleep in its structural bases and mechanisms. The second part of the paper outlines some mechanisms of triggering P.S. in pontile animals. The results speak in favor of a self-regulating metabolic process, located in the pons, and the possibility of a neuroglial mechanisms is considered.

R 79

26,364

Jacobs, J.N., Johnson, K.A. & Abma, J.S. AN EVALUATION OF PROGRAMED INSTRUCTION FOR TEACHING FACTS AND CONCEPTS. FINAL REPORT APRIL 1964-AUGUST 1965. Contract AF 33(657) 10234, Proj. 1710, Task 171007, AMRL TR 65 222, Dec. 1965, 25pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Program Development Div., Cincinnati Public School System, Cincinnati, Ohio).

This study evaluated 5 methods of teaching an academic topic ("Bill of Rights") to high school classes. The 5 methods were: a) linear program in class; b) linear program as homework plus discussion in class; c) text version of linear program in class; d) text version of linear program as homework plus discussion in class; and e) conventional lecture-discussion method in class. The linear program alone provided the best results when measured both for the learning of factual material and general concepts about the topic. The linear program was best for high, intermediate, and lower levels of scholastic aptitude.

26,365

Garvey, Catherine & Rocklyn, E.H. DEVELOPMENT AND EVALUATION OF A TACTICAL MANDARIN CHINESE LANGUAGE COURSE. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task CONTACT, Subtask 111, Tech. Rep. 65 15, Dec. 1965, 49pp. Human Resources Research Office, George Washington University, Alexandria, Va.

To meet the need for a short, self-instructional tactical language course in a Far Eastern tonal type language of potential military significance, a course in Mandarin Chinese was developed, by adapting the methods described in Subtask CONTACT 11 with reference to a European type language (Russian). The purpose of the course was to enable combat soldiers to acquire perishable tactical information from newly captured POWs. The course was programed in the format of the Russian model with a major change in the additions of tone-discrimination and tone-production lessons. 6 male students, high school seniors and graduates with varied language-learning aptitudes, took the course and completed it in 61 to 84 hrs. Their final test scores, indicating ability to speak and understand all the assigned Chinese vocabulary, ranged from 55% to 98% correct. In a simulated questioning test, the M percentage of correctly translated answers was 86%. Although low language-learning aptitude was associated with lower scores, the overall achievement appeared to be satisfactory.

R 6

26,366

Haines, D.B. & Eachus, H.T. A PRELIMINARY STUDY OF ACQUIRING CROSS-CULTURAL INTERACTION SKILLS THROUGH SELF-CONFRONTATION. FINAL REPORT JULY 1964-AUGUST 1964. Proj. 1710, Task 171008, AMRL TR 65 137, Sept. 1965, 41pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

An experiment was carried out to assess the relative effectiveness of 2 methods of training USAF military advisors in cross-cultural skills. A scenario was constructed requiring Ss to play the role of an American USAF Captain who had to interact, in specified ways with a "foreign counterpart," a role played by an actor. A list of 34 behaviors appropriate to the situation and fictitious culture were provided the S. The behaviors required ranged from actions, gestures, etc which were similar to those in our own society, to those which were considerably different. 23 male Ss were divided into control and experimental groups and taught the desired behaviors by 2 methods: a) Verbal coaching after a role-playing session; b) self-confrontation by a videotape replay after a role-playing session. Considerable improvement resulted from these methods. The experiment confirmed the effectiveness of self-confrontation as a training technique for the rapid acquisition of complex and subtle skills of interaction--an area of difficulty encountered by USAF advisors on counterinsurgency training missions. Suggestions for further research on self-confrontation as a training technique are made.

R 13

26,367

Eachus, H.T. SELF-CONFRONTATION FOR COMPLEX SKILL TRAINING. REVIEW AND ANALYSIS. FINAL REPORT APRIL 1964-DECEMBER 1964. Proj. 1710, Task 171008, AMRL TR 65 118, Sept. 1965, 12pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A review of the literature on self-confrontation and related phenomena was conducted to investigate the feasibility of their use as training techniques. The phenomenon of self-confrontation is the feedback of an individual's performance in a given situation through the use of videotape or sound motion picture film. This technique provides complete feedback of information and generates a situation in which Ss are quite amenable to modifications of their behavior, both verbal and nonverbal, with respect to given standards. The body of technical literature dealing with self-confrontation is small but complete enough to provide a basis for discussion of the phenomenon as a training technique. The analysis of the literature resulted in the recommendation for a research program to explore self-confrontation as a training technique for complex human skills.

R 26

26,368

Johnson, K.A. & Senter, R.J. A COMPARISON OF FORWARD AND BACKWARD CHAINING TECHNIQUES FOR THE TEACHING OF VERBAL SEQUENTIAL TASKS. FINAL REPORT JANUARY 1965-JULY 1965. Contract AF 33(615) 1046, Proj. 1710, Task 171007, AMRL TR 65 203, Dec. 1965, 13pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio & University of Cincinnati, Cincinnati, Ohio).

3 experiments were conducted to determine the relative merits of forward and backward chaining in the learning of sequential (serial) tasks. Previous research with animals has indicated the superiority of backward chaining and this principle frequently has been proposed for human learning. In all experiments the materials consisted of lists formed from familiar items (numbers, letters, words) arranged in arbitrary sequences. In the forward-chaining technique the S begins by practicing the 1st item in the sequence. Next he practices the 1st and 2nd items, then the 1st, 2nd and 3rd items, and so on until he is practicing the entire sequence. In the backward-chaining technique the S begins by practicing the last item in the sequence. He then practices the next-to-the-last and last items, then the 3rd-from-last, next-to-last, and last items, and so on until he is practicing the entire sequence. In all 3 experiments, the forward-chaining technique was superior to the backward-chaining technique. In the 1st experiment, this difference was not reliable, but in each of the remaining experiments, it was.

R 8

26,369

Hopkinson, R.G. BIBLIOGRAPHY OF LIGHTING LITERATURE FROM THE JOURNALS OF LIGHTING SOCIETIES, ETC. FOR 1964. ca. 1965, 15pp. Department of Scientific & Industrial Research, Garston, Herts, England.

This bibliography includes articles on lighting published in 1964 in the following journals: a) Transactions of the Illuminating Engineering Society (London); b) Light and Lighting (London); c) Public Lighting (London); d) Ljuskultur (Journal of the Swedish, Danish and Norwegian Lighting Societies); e) Svetotekhnika (Lighting Technology) (Moscow); f) Licht-technik (Journal of the German Lighting Society); g) International Lighting Review; h) Philips Technical Review; i) Lux (Journal of the French Association of Lighting Engineers); j) Bulletin of the French Society of Electrical Engineers.

R many

26,370

Sherman, M.A. THE RELATION OF POSTTEST PERFORMANCE TO RESPONSE-CONTINGENCIES IN PROGRAMMED INSTRUCTION. Contract AF 19(628) 2404, Proj. 7682, Task 768204, ESD TR 65 357, June 1965, 6pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Harvard University, Cambridge, Mass.).

2 programs, containing fictitious subject matter, were employed in a study designed to compare the teaching effectiveness (as measured by posttest) of textual material presented: a) as contingencies for responses in a program; or b) as material upon which responses were not contingent. The content of the programs was identical, and they differed only in that material whose reading was necessary for correct responding in 1 program was not necessary for correct responding in the other and vice versa. The posttest was the same for all Ss. Half of the posttest related to material which was response-contingent in 1 of the programs, and the other half related to material which was response contingent in the other program. Results indicate that response-contingent material leads to higher posttest scores than the same material when it is not necessary for correct responding within the program. The probability of information being acquired from a program is increased when this information is response contingent.

R 4

26,371

Blumenfeld, W.S. RECRUIT TRAINING AND REENLISTMENT: AN OVERVIEW. Contract 3.1607.01.02.S2, Tech. Bull. 65 1, July 1965, 21pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 467961)

Since recruit training experiences may be related to reenlistment 4 yrs. after, extended visits were made to the Recruit Training Commands at San Diego and Great Lakes in order to become familiar with Navy recruit training and to obtain information regarding recruit values, beliefs, and expectations. Basic training centers of the Army, Air Force, and Marine Corps were also visited to obtain a frame of reference with which to evaluate the observations, information, and comments obtained at the Naval RTCs. Based upon direct observation and comments of the RTC staffs and recruits, and building upon the rationale that: a) recruit training is a job sample; and b) past behavior is predictive of future behavior, the following areas were suggested to be the most promising in terms of concentration of research attention: a) specific attitude objects (factors), e.g., Sailor, Company Commander, Service Week, Discipline, and Marlinpike; b) discrepancies between the recruit's expectations and his actual perceptions of recruit training; c) tolerance of school situation, i.e., affect for and ability to survive in the academic aspects of recruit training; d) group living; e) company composition; and f) duty and responsibility, e.g., accepting "needs of the service" as a way of life. The following hypotheses is proposed as a basis for research: As the discrepancy between the values of the individual and of the Navy increases, the probability of his reenlistment decreases. The applicability of this hypothesis to the areas of research cited is indicated. The problem of criteria is discussed, and means for implementing a program of research are outlined. The long-range potential of the research program is indicated.

R 1

26,372

Haines, D.B. TRAINING FOR GROUP INTERDEPENDENCE. FINAL REPORT. Proj. 1710, Task 171008, AMRL TR 65 117, July 1965, 20pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Small teams and crews working together in intimate coordination are the key to many USAF missions today and effective team performance may depend upon member interdependency within the group. An adequate training program requires understanding of the ways in which men work together in closely-knit groups. Goal and means interdependency in group process has long been a focus of interest for social psychologists. Current research and theory thus may provide useful guidelines for applications of group interdependency principles to military crew situations (particularly that of the American military advisor working with his foreign counterpart). The concepts of goal and means interdependency are defined, the controversy between current exponents of cognitive and stimulus-response (S-R) theory is examined for its contribution to understanding group interdependency phenomena, the recent adaptation of the theory of games is reviewed, and suggestions are made for the development of experimental training programs which will furnish insights into the nature of group functioning.

R 52

26,373

Stapleford, R.L., Johnston, D.E., Teper, G.L. & Weir, D.H. DEVELOPMENT OF SATISFACTORY LATERAL-DIRECTIONAL HANDLING QUALITIES IN THE LANDING APPROACH. Contract NAS 2 864, NASA CR 239, July 1965, 109pp. National Aeronautics & Space Administration, Washington, D.C. (Systems Technology, Incorporated, Hawthorne, Calif.).

An analytical method is presented for developing satisfactory lateral-directional handling qualities in the landing approach. The method includes the following 3 steps: a) Analysis of the handling qualities of the basic airframe to determine what deficiencies, if any, exist; b) Determination of stability augmentation requirements for satisfactory handling qualities; c) Assessment of the operational tradeoffs among the various mechanizational possibilities. 12 factors for the handling-quality evaluations of steps 1 and 2 are developed. Preliminary estimates of the values necessary for a good pilot rating are derived from previous studies and from tests of several supersonic transport configurations evaluated on the Transport Landing Simulator of the Ames Research Center of the NASA. The operational tradeoffs considered in step 3 include reliability, maintainability, and cost.

R 19

26,374

Hannah, L.D. & Reed, L.E. BASIC HUMAN FACTORS TASK DATA RELATIONSHIPS IN AEROSPACE SYSTEM DESIGN AND DEVELOPMENT. FINAL REPORT AUGUST 1965-DECEMBER 1965. Proj. 1710, Task 171006, AMRL TR 65 231, Dec. 1965, 62pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

The generation, use, and flow of human factors task data in aerospace system design and development are described. The data are characterized by a process of continual transformation in content and form of presentation occurring throughout the iterative cycles of system development. The networks within which data flow are shown to be extensive in size, pervasive in nature, and complex in their dynamic relationships. These dynamic processes are illustrated in flow diagrams showing the relationships of human factors task data and their input/output elements in functional analysis for planning, specifications, task analysis, human engineering, reliability, maintainability, qualitative and quantitative personnel requirements information, training equipment planning information, and maintenance manuals.

R 12

26,375

Mauceri, A.J. FEASIBILITY STUDY OF PERSONNEL IDENTIFICATION BY SIGNATURE VERIFICATION. FINAL REPORT. Contract AF30(602) 3493, Proj. 8501, Task 850101, RADC TR 65 33, Rep. SID 65 24, April 1965, 97pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Space & Information Systems Div., North American Aviation, Inc., Downey, Calif.).

The Feasibility Study of Personnel Identification by Signature Verification consists of the acquisition of signature samples from test Ss utilizing an instrumented writing device. The signature samples are then analyzed statistically for relatively invariant indices used to establish identity. When these identity patterns are established, the system is capable of differentiating automatically, with a high degree of accuracy, between 2 or more Ss. The instrumentation of the writing device, establishment of indices, and the analysis program represent the major primary development areas.

R 5

26,376

Walther, R.E. & Crowder, N. A GUIDE TO PREPARING INTRINSICALLY PROGRAMMED INSTRUCTIONAL MATERIALS. FINAL REPORT DECEMBER 1959-OCTOBER 1963. Contract AF 33(616) 6983, Proj. 1710, Task 171007, AMRL TR 65 43, April 1965, 98pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (U.S. Industries, Incorporated, Silver Spring, Md.).

To aid those responsible for the preparation of intrinsically programmed instructional materials, the procedures and techniques developed by the Educational Science Division of U.S. Industries, Inc., have here been organized into a practical working guide. The organization of this report closely follows the sequence of steps required to produce an effective intrinsic program. Although other systems of programming are identified, this guide is specifically intended for use in the preparation of intrinsic programs in either book or Tutor-Film format.

26,377

Meyer, D.E. ADJUNCT TO SELF-STUDY FOR AIRCREW REFRESHER TRAINING UNDER OPERATIONAL CONDITIONS IN THE AIR DEFENSE COMMAND, FINAL REPORT MARCH 1964-OCTOBER 1964. Proj. 1710, Task 171007, AMRL TR 65 83, March 1965, 27pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio.

This is a report of the development and experimental comparison of a self-study technique with conventional classroom methods as a means of refresher training of Air Crews under operational conditions. The self-study technique consisted of: a) a comprehensive series of multiple-choice questions covering the subject matter with each question bearing reference to the page and paragraph of a manual containing the detailed information on which the question was based; b) a punchboard by which students immediately determined whether their answer to each question was correct or incorrect; and c) the manual to which students referred for information when they chose an incorrect answer to a question. The conclusions are: a) the preparation and administration of the self-study technique is entirely within the capability of an operational squadron with only a minimum of guidance; b) in the operational setting, the self-study technique is superior to conventional classroom methods in its effectiveness as a means of refresher training; and c) students favor the self-study method for refresher training.

26,378

Siegel, A.I. & Fischl, M.A. MASS TRAINING TECHNIQUES IN CIVIL DEFENSE.-II. A FURTHER STUDY OF TELEPHONIC ADJUNCT TRAINING. Contract OCD PS 64 30, July 1965, 62pp. Applied Psychological Services, Wayne, Penn.

The gain in knowledge accruing through use of telephonic adjunct training was investigated among individuals of limited formal education. The results indicated that both adjunct augmented telephonic training and adjunct augmented reading were more effective than either reading or unaugmented telephonic training for presenting attack survival material to this sample of Ss. The 2 prior studies in the program are reviewed, and the implications of the overall program's results for public education in civil defense are discussed.

R 8

26,379

Retterer, B.L., Griswold, G.H., McLaughlin, R.L. & Topmiller, D.A. THE VALIDATION OF A MAINTAINABILITY PREDICTION TECHNIQUE FOR AN AIRBORNE ELECTRONIC SYSTEM. FINAL REPORT JANUARY 1964-SEPTEMBER 1964. Contract AF 33(615) 1338, Proj. 7184, Task 718406, AMRL TR 65 42, May 1965, 66pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Radio Corporation of America, Camden, N.J.).

A technique for predicting the maintainability, at the field maintenance level, of airborne electronic equipment was investigated. In the technique, which was based on previously developed for ground electronic systems, design features, skill requirements, facilities and the maintenance environment are used to predict maintenance times. Predictions of elemental task-times involved in maintaining the AN/APX-46 airborne IFF were computed from ratings made independently by Air Force and contractor (RCA) personnel. These predictions were compared with each other and with data collected under field conditions in which malfunctions were artificially introduced. The 2 independent predictions of overall down time were in close agreement with each other, however, there was little agreement between the elemental task-time predictions. Although the field-condition data were limited, the analyses suggest that the prediction equation would tend to overestimate actual times. On the basis of this study it cannot be concluded that the technique, as used, accurately predicts maintenance down-time of airborne electronic equipment. However, it appears that portions of the technique could be used to evaluate the relative maintainability of alternative designs. Suggestions for modifying the techniques and for improving the predictions are presented.

R 6

26,380

Webb, J.S., Willis, J.E. & Anderson, R.D. A SELECTED ANNOTATED BIBLIOGRAPHY ON COST EFFECTIVENESS AND MAN/MACHINE FUNCTION ALLOCATION. FINAL REPORT. Res. Memo. SRM 664, Aug. 1965, 33pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif.

This bibliography includes the references and summaries of over 100 publications pertaining to system costs, system effectiveness, cost-effectiveness ratios, and man/machine function allocation.

R 103

26,381

Morsh, J.E., Georgia, M., Joyce & Madden, J.M. A JOB ANALYSIS OF A COMPLEX UTILIZATION FIELD: THE R & D MANAGEMENT OFFICER. Proj. 7734, Task 773401, PRL TR 65 1, Jan. 1965, 60pp. USAF Personnel Research Lab., Lackland AFB, Tex.

Using data collection procedures developed for airman career fields, the 6 specialties in the R & D Management Utilization Field were surveyed. A job inventory composed of 373 task statements and a Background Information Sheet was developed and mailed to all Air Force R & D Management officers. Analysis of 825 completed inventories by an iterative grouping technique allocated 675 of the officers' jobs to 27 job types, each including at least 5 jobs. The dominant job type (R & D Manager) included nearly half of the R & D Management officers. Most of the job types cut across grade levels and organization levels. Reported minimum academic requirements were a bachelor's degree with major in science or engineering. Some officers considered graduate training in management or administration desirable and some suggested additional experience in operational commands. The incumbent officers averaged more experience and education than they judged to be minimal. An appendix gives the computer printouts of job descriptions for 2 of the identified job types: R & D Project Staff Officer, Foreign Technology Staff Officer.

R 3



26,382

Pomaroelli, R.S. THE EFFECTIVENESS OF THE NAVAL AIR BASIC INSTRUMENT TRAINER. Spec. Rep. 65 7, Nov. 1965, 41pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla. (AD 627218)

This study evaluated the effectiveness of the Naval Basic Instrument Trainer (NavBIT) as it is currently used in the Basic and Radio Instrument Navigation Stages of Basic flight training. Findings are based on a detailed study of individual student reactions and on an intensive search of the pertinent literature. The study indicates that the Naval Basic Instrument Trainer is doing an effective job as an aid to teaching instrument flight, and that the expenditure for a more elaborate simulator would not be justified in terms of increased effectiveness. It also points out that the students themselves feel that the link trainer is adequately fulfilling its basic purpose of teaching procedures, scan, and the reading of instruments.

R 13

26,383

Guberina, T. SUVAG AND SUVAG-LINGUA (SPEECH ANALYSERS). Transl. T 4 Y, Aug. 1965, 2pp. Directorate of Scientific Information Services, DRB, Ottawa, Ontario, Canada. (Hearing & Speaking Rehabilitation Center, Zagreb, Yugoslavia). (AD 624840)

SUVAG II is an apparatus for finding the optimal auditory field corresponding to the particular requirements of persons hard of hearing. By listening to speech within an optimal field, as determined by means of the apparatus, rehabilitation may be achieved and an increase of comprehension secured, whereas the trouble may persist stubbornly when the listening is done with the unaided ear. Furthermore, the apparatus has shown itself particularly useful in the fitting and adjustment of hearing aids. The sonic characteristics of a hearing aid are adjusted to characteristics which, after rehabilitation, give the pathological ear the greatest possibilities of hearing. SUVAG-LINGUA is an electronic apparatus whereby it is possible to modify the frequency characteristic curve of acoustic communication between a speaker and a listener (emission-perception) in such a way that an optimal frequency range is secured. This apparatus is used in scientific laboratories, schools and foreign-language courses. For the teacher this apparatus is a technical aid, by means of which he can enable the student to perceive the differences in the phonemes of a foreign language and of his mother tongue. Thus the student is permitted to hear, in an optimum frequency range, the proper production of the phonemes of the foreign language and then to correct his own pronunciation thereby. Besides affording the possibility of selecting optimal frequency ranges (which may be either continuous or discontinuous), the apparatus makes it possible for the student-listener to pick up the rhythm of speech (low frequencies) and thus "stimulates" the student with this important linguistic factor.

26,384

Lajeunesse, D.J., Weis, E.B., Jr. & Hogan, T.J., Jr. SYSTRAN (SYSTEMS ANALYSIS TRANSLATOR): A DIGITAL COMPUTER PROGRAM. Contract AF 33(616) 10010, Proj. 7231, Task 723101, AMRL TR 65 133, July 1965, 315pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

The mechanics, mathematics, and usage of a program written in FORTRAN IV and MAP for the IBM 7094 are described. The program is called SYSTRAN (systems analysis translator) and it includes subroutines for most of the common tools for frequency domain analysis of linear systems (such as Fourier transforms and inverse Fourier transforms, complex algebra, and correlation functions). The report is essentially an instruction manual. It contains a discussion of all aspects of the program essential to competent usage.

R 15

26,385

Garden, J.W., Wilson, I.D. & Rasch, P.J. OPTIMAL TIME OF EXPOSURE REQUIRED TO PRODUCE ACCLIMATIZATION TO A HOT-WET ENVIRONMENT. BuMed Proj. MFO22.03.04 8002.3, Aug. 1965, 30pp. USN Medical Field Research Lab., Camp Lejeune, N.C. (AD 620693)

38 young adult males were exercised daily for 2 weeks on a motor-driven treadmill at 3.5 mph located in a heat chamber maintained at 98°F. dry bulb and 90°F. wet bulb. 12 Ss walked for 50 min. followed by 10 min. rest in the heat; 13 Ss walked 50 min., rested 10 min., walked 30 more min. and rested a final 10 min.; 13 Ss walked 50 min., rested 10 min., walked 50 more min. and rested a final 10 min. A modified Balke performance test was administered before heat exposure and at the end of each week. Physiological parameters including rectal temperatures, heart rates, sweat loss and sweat electrolytes were used as measures of acclimatization. It was found that the daily exposure to heat for 1 hr. did not produce acclimatization as seen in the latter groups. Several differences between physiologic adjustment to a hot-wet as contrasted with hot-dry climates were observed and are discussed.

R 9

26,386

Blosser, Anne B. A PERFORMANCE-ORIENTED APPROACH TO DETECTION: TABLES FOR DETECTION, DISCRIMINATION, AND DECISION THEORY. Contract N0bsr 93140, TRACOR 65 267 U, Aug. 1965, 75pp. Tracor, Incorporated, Austin, Tex.

This document contains a set of 16 tables constructed for analyzing detection performance data as a function of signal probability and the corresponding computer programs.

R 7

26,387

Gillingham, K.K. TRAINING THE VESTIBULE FOR AEROSPACE OPERATIONS. CENTRAL CONTROL OF VESTIBULAR FUNCTION. Review 8 65, Sept. 1965, 29pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

Emphasis must be placed on the evidence that the vestibular system is capable of being trained. 1 aspect of the mechanism by which training can be wrought, the vestibular efferent system, has been discussed. On the basis of our understandings of the vestibular system, of spatial disorientation, and of motion sickness, we should be able to deal with operational vestibular problems by using the tools of education and training. It remains to be determined whether the most effective and economical approach to vestibular training lies in more effective didactics, more sophisticated utilization of the suppression mechanism, the actual changing of erroneous vestibular responses into correct responses or any combination thereof. Whatever the method, the need for vestibular training persists as long as spatial disorientation wastes the lives of aircrew and motion sickness compromises military effectiveness.

R 124

26,388

Crook, M.N. & Bishop, H.P. EVALUATION OF MACHINE TRANSLATION. FINAL REPORT. April 1965, 63pp. Institute for Psychological Research, Tufts University, Medford, Mass.

The following measures were investigated for the purpose of evaluating translations: Ratings for translation fidelity and for quality of English by 2 categories of raters, both of which were competent in the relevant languages but only 1 of which was acquainted with the subject-matter area of the translations. Comprehension-test scores by Ss ranging from student to professional levels of competence in the subject-matter area. Ratings for intelligibility by the professional-level test Ss. Cloze scores, requiring the filling in of deleted words, by student-level test Ss. The test material consisted of 24 passages in solid-state physics, averaging a little over 200 words in length, prepared in 6 translations, as follows: 2 authentic machine translations, 2 simulated machine translations, 1 high-quality human translation, and 1 degraded human translation. All of the measures appeared capable of systematically scaling the translation levels, given a sufficient amount of data for reliability. Relations between the measures were in several cases non-linear, and in some cases different measures did not rank all of the translation levels in the same order. For efficiency in data production, ratings were found to have certain advantages over test scores. The question whether any of the measures is a highly valid index of translation fidelity remains unanswered. It could be concluded that a relatively mechanical procedure such as the cloze test might be a useful measure if empirically validated on a particular type of material.

R 4

26,389

General Electric Company. PERFORMANCE EVALUATION PROGRAM. HUMAN ENGINEERING STUDY REPORT. Contract DA 19 020 AMC 00410(Y), Repts. XM 134 & 65APB16, March 1965, 10pp. Missile & Armament Dept., General Electric Company, Burlington, Vt. (AD 461251)

This report discusses the results of the human engineering study performed on the XM-134 gun. The gun was reviewed in terms of the latest criteria, methods, and techniques. Operator tasks during maintenance, disassembly and reassembly, were evaluated. The items noted for modification or redesign to improve the performance of these tasks are described, e.g. housing clamps, track assembly in bolt access housing, timing pin location.

26,390

Hall, J.F., Jr., Buehring, W.J. & Strobl, W.W. EFFECTS OF VARIOUS GASES ON HANDGEAR INSULATION. FINAL REPORT SEPTEMBER 1964-MARCH 1965. Proj. 7164, Task 716409, AMRL TR 65 4, Dec. 1965, 10pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

The effect of gases having different thermal conductivities on the thermal insulation of handgear was investigated. Experimental mittens with special plastic spacer interliners of various thicknesses were sealed between gas impermeable outer and inner shells and filled first with room air (as control), then various experimental gases, and thermal insulation measured on a copper hand. Experimental gases included CO<sub>2</sub>, Freon-12, and helium. Comparative results are presented in terms of percentage insulation change: clo per in; conductivity (K) values; and the measured thermal insulation (clo) values. Before all tests each mitten was evacuated (13 cm Hg) to remove all entrapped air, then filled without contamination with the control, or experimental gas. Gas within the handgear was maintained at a constant positive pressure (5 cm water) throughout each experiment. M measurements showed significant increases (13-32%) of thermal insulation for Freon-12 and CO<sub>2</sub>, with decreased insulation observed with helium. Significance and some practical application of these results for protective clothing design are shown.

R 6

26,391

Geisler, M.A. & Ginsberg, A.S. MAN-MACHINE SIMULATION EXPERIENCE. Rep. P 3214, Aug. 1965, 23pp. Rand Corporation, Santa Monica, Calif. (AD 469621)

The purpose of this paper is to present a general discussion of the technique of man-machine simulation or game-simulation, drawing, in particular, on the experience of The Rand Corporation's Logistics Simulation Laboratory (LSL).

R 5

26,392

USA Tropic Test Center. FINAL REPORT OF SERVICE TEST OF HOT AND COOL WEATHER SLEEPING SYSTEM. DA Proj. IM643303D547 & USATECOM Proj. 8 3 7120 02, March 1965, 67pp. USA Tropic Test Center, Fort Clayton, Canal Zone, Panama. (AD 461319)

The Hot and Cool Weather Sleeping System was service tested by the U.S. Army Tropic Test Center in the Canal Zone, Republic of Panama and in the Republic of Chile during the period 1 October 1964 through 30 January 1965. System weight and volume exceeded Military Characteristic requirements. Material was not resistant to flame or high thermal radiation. Suspended hammock was awkward to erect in the dark, and user was deprived of use of poncho as raincoat substitute and other purposes when complete system was in use. The T64-2 hammock was preferred over the T64-1 hammock. The system was found acceptable for use in present form in temperature ranging upward from 45° F. after the following shortcomings are corrected. Rain protector fabric on hammock was too weak. Twisted polyester ropes unraveled. Knit shirt sleeves were too tight for comfort on forearm and wrist. Easily tangled bridle lines hindered rapid assembly of suspended hammock. It was recommended that the Hot and Cool Weather Sleeping System containing the T64-2 hammock be considered suitable for general Army and Special Forces use when shortcomings are corrected and that development of an improved system be continued to improve operating characteristics and to meet the Military Characteristics.

26,393

University of Pittsburgh Army Materiel Research Staff. DEVELOPMENT OF AIR DEFENSE GUIDED MISSILE SYSTEM SIMULATOR, HAWK. Contract DA 49 186 AMC 214(D), DA Proj. 1X279191D690, TIR 33.3.3.2, March 1965, 7pp. University of Pittsburgh Army Materiel Research Staff, Washington, D.C. (AD 463011)

This Technical Information Report describes the Hawk simulator, which is designed to provide a realistic combat presentation for Hawk ground-to-air, low-level, defense missile crews. It provides moving targets that may be identified, tracked, and fired upon, all in a simulated combat environment. Missile flight and target kill effects are also simulated. Electronic countermeasures, as well as chaff (window), can be injected in an attempt to jam the Hawk radars--thus providing exercises in the use of electronic counter-countermeasures. The entire Hawk defense team can play the problems out as they would a game, so that when and if it becomes necessary to face an actual combat situation crew action will be the repetition of familiar tasks, performed almost by reflex.

26,394

Shriver, E.L. & Trexler, R.C. APPLICATION AND TEST OF THE FORECAST CONCEPT OF ELECTRONICS MAINTENANCE ON NAVY LORAN EQUIPMENT. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 65 3, May 1965, 53pp. Human Resources Research Office, George Washington University, Alexandria, Va.

This report describes the Technical Advisory Service rendered to the Navy in connection with the Task FORECAST concept of electronics maintenance. This concept is presented as a collection of policies, methods, techniques, and services integrated in a plan for improved level of electronics maintenance in the services. Special reference is made to the application of the FORECAST concept to the Navy LORAN system and to the resulting products and level of performance achieved. In implementing FORECAST procedures, Navy chief petty officers, working with FORECAST scientists, produced a technical manual and training program, using an especially designed device and programed instruction. The same tests in identifying malfunctions in LORAN systems were given to 86 Navy electronics technicians, FORECAST trained, and to 12 graduates of a conventional Navy course. FORECAST students identified 39% of the bad parts; conventionally trained students, 13%.

R 7

26,395

Stevens, S.S. & Diamond, A.L. EFFECT OF GLARE ANGLE ON THE BRIGHTNESS FUNCTION FOR A SMALL TARGET. Vision Research, Dec. 1965, 5, 649-659. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

The effect of a small, intense glare source (118 db) on the brightness of a small target was measured as a function of glare angle and target luminance. Using an interocular matching procedure the O adjusted the brightness of a match field (seen by the right eye) to equal the depressed brightness of the target under the influence of the glare (seen by the left eye). Glare angle was varied from 13.2 to 274 min. Target luminance was varied from 58 to 93 db relative to  $10^{-10}$  Lambert. For all target luminances, the apparent brightness of the target was shown to be directly related to the logarithm of the glare angle. At a given glare angle the brightness grows as a power function of the luminance, and the exponent of the power function is largest when the glare angle is smallest. In double logarithmic coordinates the functions relating the luminance of the match field to that of an equally bright target become straight lines that converge at a common point, equal to the luminance of the glare (118 db).

26,396

Baird, J.C. AREA AND DISTANCE ESTIMATION OF SINGLE AND MULTIPLE STIMULI. Vision Research, Dec. 1965, 5, 661-678. (USA Walter Reed Army Research Institute, Walter Reed Medical Research Center, Washington, D.C.).

The relative importance of single and multiple stimuli in the estimation of area and distance was examined in 4 experiments. The stimuli usually were black and white squares arranged in different frequencies, sizes and spacings to represent diverse 0-object distances. Magnitude estimation was used, and the results suggested that area estimates were not greatly affected by multiple stimuli, whereas distance estimates were more dependent upon 0 and stimulus differences. The curve describing area estimates in 3 of the 4 experiments was negatively accelerated over the stimulus range. Most of the corresponding distance curves were positively accelerated. It was concluded that cues derived from multiple stimuli were subordinate to those based upon single stimulus changes.

R 44

26,397

Dimmick, F.L. COLOR SPECIFICATION BASED ON JUST NOTICEABLE DIFFERENCES OF HUE. Vision Research, Dec. 1965, 5, 679-694. (New Brunswick, N.J.).

The proposed equal hue system utilizes the experimental measurements of "just noticeable differences" of hue to specify the stimulus conditions in terms of  $m\lambda$  for all discriminable hues generated by "monochromatic" wavebands ( $5m\lambda$ ) from 400 to 700  $m\lambda$ . By plotting these specifications as a "spectrum locus" in rectangular coordinates, all colors produced by broad band spectral distributions can be specified by their positions in that coordinate system or as a ratio of 2 unique colors. The JND is the basic unit of the system and represents a change in hue proportional to 2 unique colors defining a particular hue series. The specifying ratio is calculated from a spectral distribution curve by integrating the "color values" at every  $m\lambda$ , which have been derived from the experimental data specifying JND steps of the spectral colors. Since the coordinate system is based upon judgments of color discrimination differences in specification indicate directly the amount and direction of differences in color appearance.

R 9

26,398

Zuber, B.L. & Miller, D. INSTRUMENT NOTE: A SIMPLE, INEXPENSIVE ELECTRONIC PUPILLOMETER. Vision Research, Dec. 1965, 5, 695-696. (Information Engineering Dept., University of Illinois, Chicago, Ill. & Cornea Service, Massachusetts Eye & Ear Infirmary, Boston, Mass.).

This note describes a direct-recording infrared pupillometer which provides a voltage proportional to pupil area. This simple device may be used to measure pupillary area. (HEIAS)

R 2

26,399

Glezer, V.D. THE RECEPTIVE FIELDS OF THE RETINA. Vision Research, Oct. 1965, 5, 497-525. (Vision Physiology Lab., USSR Academy of Sciences, Leningrad, Russia).

On the basis of psychophysiological and electrophysiological experiments, in which the role of the receptive fields of the retina in light sensitivity, adaptation, contrast, visual acuity, flicker fusion frequency and regulation of eye movements have been investigated, this hypothesis is put forward: according to which the receptive field is considered as a servo system, in which the light stimulus causes excitation and inhibition, balancing it. These processes have different spatial gradients and different time-constants, changing as a function of illumination. It is supposed that owing to such an organization the receptive field is a functional unit of the retina, performing some operations in the processing of visual information.

R 70

26,400

Bortoff, A. & Norton, A.L. SIMULTANEOUS RECORDING OF PHOTORECEPTOR POTENTIALS AND THE PIII COMPONENT OF THE ERG. Vision Research, Oct. 1965, 5, 527-533. (Physiology Dept., State University of New York, Syracuse, N.Y.).

Photoreceptor potentials were recorded with microelectrodes from the Necturus retina after isolating the PIII component of the electroretinogram (ERG) with NaCl and azide. Because both potentials exhibited several common characteristics, such as time of onset and of termination, polarity, configuration, and response to intermittent light stimulation, it was concluded that the photoreceptor potential and the PIII are, at the very least, manifestations of the same process. It follows that the photoreceptor potential may be closely related to, if not directly responsible for, the a- and d-waves of the ERG. The battery which generates these potentials is probably not located in that part of the photoreceptor cell membrane impaled by the microelectrode since small quantities of KCl solution added to the vitreous were found to reduce the photoreceptor potential without noticeably affecting the ERG, while larger quantities of KCl, sufficient to isolate the PIII component, resulted in the disappearance of the photoreceptor potential.

R 10

26,401

Nachmias, J. & Steinman, R.M. BRIGHTNESS AND DISCRIMINABILITY OF LIGHT FLASHES. Vision Research, Oct. 1965, 5, 545-557. (Psychology Dept., University of Pennsylvania, Philadelphia, Penn.).

3 experiments were performed to test the hypothesis that for equally bright flashes of different duration, equally discriminable luminance differences are subjectively equal. The hypothesis received qualitative support from the finding that it takes a smaller difference in the log luminance of brief flashes (52 msec) than of longer ones (230 msec) to produce either a given difference in brightness or a given discrimination performance. Contrary to the hypothesis, however, the log luminance difference of 52-msec flashes relative to that of 230-msec flashes is smaller for equal brightness differences than for equal discriminability.

R 23

26,402

Thomas, J.P. & Kovar, Constance W. THE EFFECT OF CONTOUR SHARPNESS ON PERCEIVED BRIGHTNESS. Vision Research, Oct. 1965, 5, 559-564. (University of California, Los Angeles, Calif.).

The present experiment demonstrates the effect of the sharpness of the contour separating stimulus from background upon the perceived brightness of the stimulus. With increasing blur of the stimulus edges the perceived stimulus brightness decreases monotonically. The effect is found over all degrees of blur, all stimulus-to-background intensity ratios, and all levels of light adaptation examined. There seems to be a decrease in the magnitude of the effect in a detection task and at extremely low adaptation levels. Relevance of the findings to possible underlying mechanisms for brightness perception is discussed.

R 6

26,403

Fisher, A.J. & Christie, A.W. A NOTE ON DISABILITY GLARE. Vision Research, Oct. 1965, 5, 565-571. (Road Research Laboratory, Middlesex, England).

To describe the effect of glare on visibility Holladay (1927) and Stiles (1929) used an equivalent background luminance given by the formula  $(=B + kE/\theta^n)$  in which B is the actual background luminance, E is the glare illumination at the observer's eye, and  $\theta$  is the angle of the glare source from his line of sight. The use of the formula is discussed and 3 experiments are described on the effect on the parameters n and k of: a) the distribution of luminance over the background against which the test object is seen; and b) the age A of the O. It appears that n may be substantially independent of both factors and that k may be related to both of them according to the formula  $(k + cA=d)$  in which d is dependent on the background configuration and c is not.

R 12

26,404

Brown, J.L. & Ranken, H.B. LUMINANCE, PURITY AND WAVE-LENGTH MATCHES OF CONTRAST COLORS. Vision Research, Aug. 1965, 5, 443-453. (Physiology Dept., University of Pennsylvania School of Medicine, Philadelphia, Penn. & Psychology Dept., Purdue University, Lafayette, Ind.).

Contrast colors induced in a central "white" area by surrounding inducing colors were matched in the contralateral eye. Results are presented in terms of luminance, wavelength of a spectral component, and colorimetric purity of the match as well as in C.I.E. values. A relation between colorimetric purity of the match and saturation of the inducing color is indicated. A neutral region in C.I.E. color space is roughly defined which differs from the locus of the "white" component employed in the experiment.

R 14

26,405

Ebenholtz, S.M. & Walchli, R.M. STEREOSCOPIC THRESHOLDS AS A FUNCTION OF HEAD- AND OBJECT-ORIENTATION. Vision Research, Aug. 1965, 5, 455-461. (Psychology Dept., Connecticut College, New London, Conn.).

Stereoscopic thresholds were measured under 6 degrees of lateral tilt of object and 0 respectively. Thresholds increased inversely with the cosine of the angle of inclination. Conditions of head-tilt produced significantly lower thresholds than object-tilt. These results are not compatible with presently available geometric models of binocular disparity.

R 17

26,406

Turner, P. THE MODIFICATION OF CRITICAL FLICKER FUSION FREQUENCY BY AN ADAPTING STIMULUS OF FLICKERING LIGHT. Vision Research, Aug. 1965, 5, 463-470. (Pharmacology Dept., St. Bartholomew's Hospital Medical College, London, England).

The critical flicker fusion frequency is elevated by adaptation to intermittent light of high frequency and depressed by intermittent light of lower frequency. This relationship is almost linear between adapting frequencies of 24 & 54 c/s. Monocular experiments demonstrate that this phenomenon is centrally mediated, and that it is unaffected by hyperventilation or rebreathing, although hyperventilation significantly elevates the fusion threshold. It is suggested that this adaptation phenomenon is another example of the tendency of a "neutral point" to move towards the adapting stimulus as has been described in other modalities.

R 10

26,407

Baumgardt, E. & Smith, S.W. FACILITATION EFFECT OF BACKGROUND LIGHT ON TARGET DETECTION: A TEST OF THEORIES OF ABSOLUTE THRESHOLD. Vision Research, June 1965, 5, 299-312. (Laboratoire de Neurophysiologie generale, Section Vision, College de France, Paris, France & Institute for Research in Vision, Ohio State University, Columbus, Ohio).

A 1° circular test stimulus (target) of 1-sec. duration was presented at 10° or at 7.6° in the nasal field of the dark-adapted right eye of 4 Os using a temporal forced-choice procedure to determine frequency of seeing and thresholds for 2 conditions: a) target alone; and b) target superimposed on a steady dim or subliminal background of 1 1/2° diameter. "Intrinsic visual noise" theory predicted an increase in threshold for the target-plus-background condition which did not occur. Actually, the data for 2 Os showed a facilitation effect from the background light, i.e., frequency of seeing was higher and thresholds were lower for the background condition than for the target-alone condition. These data as well as reports of phenomenal experience were interpreted as being contrary to signal/noise discrimination theories which introduce "dark light" or intrinsic noise to account for the absolute threshold.

R 27

26,408

Kishto, B.N. THE COLOUR STEREOSCOPIC EFFECT. Vision Research, June 1965, 5, 313-329. (Vacoas, Mauritius).

An attempt has been made to study the apparent depth difference observed under certain conditions between coloured objects lying in the same plane. It has been found that with many people there occurs a reversal of this colour stereoscopic effect with change in the overall state of adaptation of the eye. Some measurements have been made to find out whether, in the absence of other clues to depth perception, the depth differences observed are solely due to the relative displacement of the images of the colour patches on the retina.

R 7

26,409

Horeman, H.W. RELATIONS BETWEEN BRIGHTNESS AND LUMINANCE UNDER INDUCTION. Vision Research, June 1965, 5, 331-340. (Instituut voor Perceptie Onderzoek, Eindhoven, The Netherlands).

A comparison has been made between results of interocular brightness matching and of asking for brightness estimations. The matching results have been translated by applying a power function transformation to the luminance values of the comparison field. The translated results of brightness matching turned out to be completely analogous to results of subjective estimations. By means of plotting the results in terms of subjective estimations relations between brightness and luminance under induction could be easier described. This has been shown in respect to effects of field configurations on these relations. Description of the relations in terms of a concept "visual gradation" analogous to gradation of photographic material has been proposed. Under induction the visual gradation has been increased for test luminances below a critical value depending on the inducing luminance.

R 8

26,410

Matteson, H.H. AFTER-IMAGES OBSERVED WITH INTERMITTENT BACKGROUND ILLUMINATION. Vision Research, April 1965, 5, 123-132. (University of Illinois, Urbana, Ill.).

It has been reported that an intermittent background can considerably prolong the duration of after-images. The luminances of both an intermittently illuminated background and a 1 degree stimulus were varied as 3 Ss made observations foveally and 5 degrees in the periphery. The results confirmed that longer durations of after-images were observed with an intermittent background compared to the durations of those observed in the dark, and further showed that with the intermittent background peripheral after-images lasted longer than foveal ones. After-image duration also increased with stimulus intensity, but the effects of background luminance varied with Ss.

R 24

26,411

Wickelgren, Barbara G. BRIGHTNESS CONTRAST AND LENGTH PERCEPTION IN THE MULLER-LYER ILLUSION. Vision Research, April 1965, 5, 141-150. (Center for Cognitive Studies, Harvard University, Cambridge, Mass.).

In the first experiment Ss judged the lengths of Muller-Lyer figures presented tachistoscopically. Both halves of the illusion increased with an increase in the ratio of the contrast between obliques and ground to the contrast between horizontal and ground. In the second experiment a new illusion was established--the 3-segment line illusion. Ss overestimated the center segment of a 3-segment line if the center and the ends of the line were all lighter or all darker than the ground. The amount of illusion increased with an increase in the ratio of the contrast between the ends and the ground to the contrast between the center and the ground.

R 7

26,412

Ruddock, K.H. THE EFFECT OF AGE UPON COLOUR VISION--I. RESPONSE IN THE RECEPTORAL SYSTEM OF THE HUMAN EYE. Vision Research, Jan. 1965, 5, 37-45. (Physics Dept., Imperial College of Science & Technology, London, England).

Data is presented which was obtained by a colorimetric survey involving some 400 Os, all with normal colour vision. The particular data given in this paper refer only to colour vision response of the receptor system, and are independent of variation in light transmission through the optical media. The results have been tested for significant correlation with age and the conclusion is drawn that age is without significant effect upon receptor colour response. A small loss in wavelength discrimination was found, but evidence is given suggesting this result to be due to non-visual aspects of the experimental technique used for measuring discrimination.

R 14

26,413

Ruddock, K.H. THE EFFECT OF AGE UPON COLOUR VISION--II. CHANGES WITH AGE IN LIGHT TRANSMISSION OF THE OCULAR MEDIA. Vision Research, Jan. 1965, 5, 47-58. (Physics Dept., Imperial College of Science & Technology, London, England).

Data on colour-matching and the relative luminous efficiency of selected spectral wavelengths are given for some 400 Os. Both sets of data are found to be significantly correlated with 0 age. The results have been compared with the effects of known and postulated age-changes in light transmission through the ocular media. It is concluded that the lens is the principal source of the observed age variations and the results also show that the macular pigment is not a significant variable with age. Finally, evidence is given which suggests that light-scattering may be the main physical cause of age-changes in light-transmission properties of the ocular media.

R 15

26,414

Donchin, E. & Lindsley, D.B. RETROACTIVE BRIGHTNESS ENHANCEMENT WITH BRIEF PAIRED FLASHES OF LIGHT. Vision Research, Jan. 1965, 5, 59-70. (Psychology Dept., University of California, Los Angeles, Calif.).

The brightness of a semi-circular test flash (TF), when followed at varying intervals by a circular, brighter flash (BF), was measured by a direct magnitude-estimation technique. There was a gradual increase in the brightness of the TF as the TF-BF interval was decreased. Brightness enhancement of the TF began when the interval between onsets of the 2 10 msec flashes was about 150 msec and attained a maximum between 100 & 30 msec, depending upon the TF luminance. The brightness of the TF is a power function of the TF-BF interval with a negative exponent; the dimmer the TF the higher the absolute value of the exponent. A model accounting for this phenomenon in neurophysiological terms has been proposed.

R 25

26,415

Crawford, B.H. COLOUR MATCHING AND ADAPTATION. Vision Research, Jan. 1965, 5, 71-78. (National Physical Laboratory, Teddington, England).

Chromaticity co-ordinates of the spectrum locus are usually determined for a field of maximum saturation. They may also be determined for a white field by the original method of Maxwell. Differences in the functions are observed which are a measure of the effect of adaptation. Significant differences have been obtained for fields of 10°, 2°, & 1° diameter at the eye.

R 8

26,416

Cooperband, A.S. & Alexander, L.T. A METHOD FOR APPLYING STATISTICAL DECISION THEORY TO SYSTEM TASK ANALYSIS. Hum. Factors, Dec. 1965, 7(6), 507-511. (Systems Development Corporation, Santa Monica, Calif.).

For system tasks involving signal detection, a method is presented by which statistical decision theory may be used to derive limiting conditions for adequate operator performance from results obtained in an abstracted laboratory task. The limiting conditions may then serve as a basis for making design decisions regarding functions allocation and for specifying operating rules. The method is illustrated with a collision-prediction task in which previous research suggests that performance depends on the ability to detect a nonzero rate of change in the relative bearing between the 2 objects moving on converging paths.

R 4

26,417

Hammer, C.H. & Ringel, S. THE EFFECTS OF AMOUNT OF INFORMATION PROVIDED AND FEEDBACK OF RESULTS ON DECISION MAKING EFFICIENCY. Hum. Factors, Dec. 1965, 7(6), 513-519. (US Information Agency, Washington, D.C. & USA Personnel Research Office, OGRD, Washington, D.C.).

60 Ss worked a series of sequential decision making tasks in which the amount of information provided and feedback of results were the independent variables. Data were collected on decision accuracy, confidence in decision accuracy, and judged sufficiency of the information provided. Accuracy, confidence in accuracy, and ratings of sufficiency increased as amount of information provided was increased. Feedback produced increases in decision accuracy only. For 40% of all correct responses, Ss judged the information provided to be insufficient as a basis for taking action. These data strongly suggest that lack of confidence in their ability to make accurate decisions may cause some decision makers to delay taking action even when they are able to make an accurate decision on the basis of the information available.

R 2

26,418

McLean, M.V. BRIGHTNESS CONTRAST, COLOR CONTRAST, AND LEGIBILITY. Hum. Factors, Dec. 1965, 7(6), 521-526. (Space & Information Systems Div., North American Aviation, Inc., Downey, Calif.).

An experimental study was conducted investigating the effects of color and brightness contrast, direction of contrast, and 6 contrast values upon the legibility of a circular dial. The brightness of 4 chromatic hues was matched with 4 achromatic hues. Hues were combined in all possible combinations excluding chromatic with achromatic, resulting in 6 contrast values. For both dark on light and light on dark contrast directions, the contrast values were equal. Half of the 24 Ss had pilot training and half did not. A Dodge type tachistoscope was used to present the stimulus conditions. Reading time results indicated that the addition of color contrast to a dial of a given achromatic brightness contrast value, with a light on dark contrast direction, will not degrade and may improve the legibility of that dial. Legibility was also found to increase as contrast value increased. The study indicates that the use of color should be reconsidered in its application as a coding technique in complex system displays.

R 16

26,419

Johnston, Dorothy M. SEARCH PERFORMANCE AS A FUNCTION OF PERIPHERAL ACUITY. Hum. Factors, Dec. 1965, 7(6), 527-535. (Boeing Airplane Company, Seattle, Wash.).

This study was made to investigate the relationship between the size of visual fields of Os and time required to locate targets on static displays. The findings, which indicate that people with large visual fields can find targets more rapidly than Os with small fields, have practical selection and training application. Equations are presented which can be used to determine search time that can be expected as a function of the size of the visual field of the O and the apparent size of the area being searched.

R 14

26,420

Kurke, M.I. OPERATIONAL CONCEPT ANALYSIS AND SOURCES OF FIELD DATA. Hum. Factors, Dec. 1965, 7(6), 537-544. (Technical Operations, Inc., Fort Belvoir, Va.).

Human factors scientists often work closely with operations analysts in the investigation of social, business and man-machine systems within viable operational organizations. The human factors approach to such operational concept studies should be commensurate with that of the operations research worker. One approach to such methodology is described in this paper as is a description of field data sources available to the Army.

R 2

26,421

Kelso, Barbara J. LEGIBILITY STUDY OF SELECTED SCALE CHARACTERISTICS FOR MOVING-TAPE INSTRUMENTS. Hum. Factors, Dec. 1965, 7(6), 545-554. (Bunker-Ramo Corporation, Canoga Park, Calif.).

A legibility study was performed to investigate the effects of scale factors, graduation marks, orientation of scales, and reading conditions on the speed and accuracy of reading moving-tape instruments. Each of 150 Air Force Officers made 150 self-paced readings from slides of hand drawn tape instruments. Error was expressed as the magnitude of deviation of a Ss' verbal response from the set scale value. An ANOVA was performed on the mean error scores, standard deviations of error, mean reaction times, and standard deviations of RTs. The results clearly favored the 1 7/8 in. scale factor over the 1 3/8 in. and the 2 3/8 scale factor. The use of 9 graduation marks was superior to either 0, 1, 3, or 4 graduation marks. Reading conditions had little effect on performance. Horizontal scales were read more rapidly but no more accurately than vertical scales.

R 20

26,422

Lippert, S. & Lee, D.M. DYNAMIC VISION: THE LEGIBILITY OF MODERATELY SPACED ALPHANUMERIC SYMBOLS. Hum. Factors, Dec. 1965, 7(6), 555-560. (Biotechnology Sec., Douglas Aircraft Company, Inc., Long Beach, Calif.).

2 experiments were conducted to investigate S performance on the basis of 2 criteria, zero and 100% legibility of moving targets. A modified method of limits was employed. The targets consisted of black alphanumeric symbols regularly spaced 7.5° apart on a brightly illuminated white background. Each target subtended an angle of 39 min. Legibility of the symbols was determined as they moved vertically from top to bottom in a frontal plane. The mean angular velocities for both the zero and 100% legibility performance levels were found to be approximately 3 times higher for the 7.5° symbol spacing than their respective velocities for a previously determined 1.5° symbol spacing. Performance was approximately twice as good with a 30° aperture as with a 3° aperture.

R 4

26,423

Christianson, R.A., Wellman, G. & Egstrom, G.H. THRUST FORCES IN UNDERWATER SWIMMING. Hum. Factors, Dec. 1965, 7(6), 561-568. (University of California, Los Angeles, Calif.).

Instantaneous and mean static thrust levels were measured for 8 underwater swimmers restrained in a submerged force platform. Swimming was examined barefoot and with 2 types of fins. The main beneficial effect of the fins was to eliminate the substantial negative thrust component associated with barefoot swimming. Higher maximal thrust outputs were achieved with curved fins than with straight-bladed ones. There were also significant differences between barefoot and finned swimming in the relationship of instantaneous thrust to leg position during the kick cycle. Kick rate and foot acceleration were both proportional to thrust output, but the relationship depended on diver size and experience.

R 9

26,424

Simon, C.W. & Craig, D.W. EFFECTS OF MAGNIFICATION AND OBSERVATION TIME ON TARGET IDENTIFICATION IN SIMULATED ORBITAL RECONNAISSANCE. Hum. Factors, Dec. 1965, 7(6), 569-583. (Hughes Aircraft Company, Culver City, Calif.).

When deciding what telescopic power is required to find objects of interest on the ground while flying over the earth at relatively high speeds, the positive value of an increased magnification must be balanced against the negative effects of a decreased observation time and an increased movement rate. The relative trade-off between these 2 factors--magnification and time--was compared in a series of 3 studies in which photographic imagery was used to simulate a telescopic view of the earth from a spacecraft orbiting at 175 nautical mi. Target acquisition decreased as image scale factor decreased and as image movement rate increased. When a change in scale factor was inversely proportional to a change in observation time, the positive effects of an increased image scale factor tended to exceed the negative effects of a decreased observation time and increased image movement rate within the limits of this study. The theoretical and practical implications of these and other results are discussed.

R 8

26,425

McKenzie, R.E. A SYSTEMS TASK USED IN THE STRESS TESTING OF SPECIAL MISSION PERSONNEL. Hum. Factors, Dec. 1965, 7(6), 585-590. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

One aspect of a psychologic evaluation program for special mission personnel was structured within a concept of competing tasks, requiring 2 operator signal-display sources. One source produced an array of discrete, discontinuous signals. The other produced a continuous input for the operator to monitor and process. The evaluation was made with reference to the performance of an "ideal" S. The results indicate that a criterion group of those finally selected for the special mission was better able to adapt to the 2 competing tasks and was less susceptible to the signal/noise ambiguity and the induced task stress than the special mission personnel group as a whole.

R 2

26,426

Metcalf, H. STILES-CRAWFORD APODIZATION. J. Opt. Soc. Amer., Jan. 1965, 55(1), 72-74. (Physics Dept., Brown University, Providence, R.I.).

The Stiles-Crawford effect is treated as an apodization in the plane of the entrance pupil of the eye by computing the pupil function from measured values of the line spread function. The resulting apodized spread function is shown to be different from the measured spread function. The differences are in the order of 10% to 20%, but may be quite significant in the light of certain neurological phenomena.

R 5

26,427

Weissman, S. & Kinney, Jo Ann S. RELATIVE YELLOW-BLUE SENSITIVITY AS A FUNCTION OF RETINAL POSITION AND LUMINANCE LEVEL. *J. Opt. Soc. Amer.*, Jan. 1965, 55(1), 74-77. (USN Submarine Medical Center, Groton, Conn.).

Relative sensitivity for yellow and blue was determined by hue cancellation, using the method of constant stimuli. Measurements were made with a 1° stimulus at the fovea, 2° above the fovea, and every 4° along the upper vertical meridian out to 18° at 3 luminance levels (0.5, 0.1, and 0.01 ft-L). Relative yellow-blue sensitivity remained much the same from fovea to periphery for the 2 highest light levels. At the lowest luminance level there was a slight increase in relative blue sensitivity in the near periphery and a progressive decrease in relative yellow sensitivity as the peripheral angle increased. The variability of color discrimination increased greatly as luminance decreased and the peripheral angle increased.

R 20

26,428

Boynton, R.M. & Gordon, J. BEZOLD-BRÜCKE HUE SHIFT MEASURED BY COLOR-NAMING TECHNIQUE. *J. Opt. Soc. Amer.*, Jan. 1965, 55(1), 78-86. (University of Rochester, Rochester, N.Y.).

3 experiments on the Bezold-Brücke phenomenon (change in the hue of spectral colors caused by change in field luminance) are reported. The first is an exact replication of Purdy's classic experiment, where the shift between 100 & 1,000 trolands is investigated by direct matching in a steadily presented bipartite field. The second is a modification of Purdy's experiment where the observer is asked to match on the basis of 300-msec flashes of the bipartite field. The third is an experiment where no matches are required, but where the observer is asked to judge the hue of a flashing stimulus using a forced-choice color-naming technique. The results of the 3 experiments are compared: differences are discussed in terms of viewing time and simultaneous contrast.

R 12

26,429

MacAdam, D.L. ANALYTICAL APPROXIMATIONS FOR COLOR METRIC COEFFICIENTS. IV. SMOOTHED MODIFICATIONS OF FRIELE'S FORMULAS. *J. Opt. Soc. Amer.*, Jan. 1965, 55(1), 91-95. (Research Labs., Eastman Kodak Company, Rochester, N.Y.).

Abrupt changes of trends, characteristic of formulas for color discrimination suggested by Friele, can be smoothed by slight modifications of Friele's formulas. Except near the places where Friele's formulas cause these changes, these modifications yield values of metric coefficients asymptotically equal to those derived from Friele's formulas. Optimum values have been obtained for parameters in the revised formulas and for the primaries. Optimum parameters have also been determined for a set of color metric coefficients derived from old, but widely used, data based on observations by P.G. Nutting, Jr. The M-square errors of reproduction of the Nutting data, with the smoothed formulas, are 5% < for the more recent Brown 12-observer data and 21% < for the somewhat less recent Brown-MacAdam data. The optimum parameters for the Nutting data are intermediate between those for the newer sets of data. Color-mixture curves are shown for direct computation of the required tristimulus values. By use of these, points can be located on the CIE 1959 diagram more easily than by use of the CIE 1931 data.

R 8

26,430

Davidson, H.R. & Taylor, M. PREDICTION OF THE COLOR OF FIBER BLENDS. *J. Opt. Soc. Amer.*, Jan. 1965, 55(1), 96-100. (Davidson & Hemmendinger, Easton, Penn. & Chemstrand Company, Decatur, Ala.).

Prediction of the formula for matching a given color standard by blending pre-dyed fibers is of considerable importance to the textile industry. Stearns and Noechel and Friele have derived functions of reflectance which are approximately linear with fiber quantity in a blend. These may be used for the purpose of formula prediction. In both cases, however, numerical constants must be determined to fit the fiber system being used. Since these constants must be empirically fitted to the data, we propose a purely empirical approach and have developed a mixture function which fits a blend of black and white solution-dyed acrylic fibers. The accuracy of the function when applied to blends of different colors was determined by experiment. 10 blends of solution-dyed Acrilan were used as standards, and formulas for the color matches were obtained on a Colorant Mixture Computer using the new mixture function. The resultant colors differed from the standards by an average of about 5 MacAdam units. Computed adjustments to the first formulas produced much closer matches.

R 5

26,431

White, L.S. & Jacobsen, A.E. NEW BLUE FILTER FOR THE COLORMASTER DIFFERENTIAL COLORIMETER BASED ON JUDD'S MODIFIED STANDARD OBSERVER. *J. Opt. Soc. Amer.*, Feb. 1965, 55(2), 177-184. (Research Dept., Titanium Div., National Lead Company, Sayreville, N.J.).

Color measurement of anatase and rutile pigmentations using various color-mixture functions has shown that Judd's 1949 modification of the standard observer provides the closest agreement with visual perception. The effect of Judd's modification is to change the z function and the short-wavelength lobe of the x function, so that for a tristimulus filter colorimeter it is necessary to change only the blue filter. Such a blue filter has been designed for use with the Colormaster differential colorimeter. With this new filter, accurate color grading (in agreement with visual perception) can be made for titanium dioxide.

R 13

26,432

Nimeroff, I. & Yurow, J.A. DEGREE OF METAMERISM. *J. Opt. Soc. Amer.*, Feb. 1965, 55(2), 185-190. (National Bureau of Standards, Washington, D.C.).

Colorimetric matches between light from objects and a three-primary visual colorimeter are generally metameric, not spectral. The amount of difference between the spectral energy distributions from the object and the colorimeter determines the degree of metamerism. Three indexes of metamerism are considered that depend on this difference. One of these indexes is shown to correlate well with the chromaticity spreads found among observers' settings for a series of metameric matches. This correlation is independent of luminance. The other indexes do not correlate with the spread of chromaticity of matches by observers.

R 10



26,433

Sperling, H.G. & Jolliffe, C.L. INTENSITY-TIME RELATIONSHIP AT THRESHOLD FOR SPECTRAL STIMULI IN HUMAN VISION. J. Opt. Soc. Amer., Feb. 1965, 55(2), 191-199. (Military Products Group Research Lab., Honeywell Inc., St. Paul, Minn.).

The intensity-time relationship at threshold of the human eye has been investigated with special attention to temporal-summation effects and Bloch's Law. The four parameters selected for this study include: a) narrow-band spectral stimuli of different dominant wavelengths; b) foveal and peripheral retinal locations; c) several stimulus sizes; and d) light and dark surrounds. The results, obtained with 3 Ss, show that the intensity-time relationship is dependent upon the wavelength of the spectral stimulus when a large (45') foveal stimulus is employed. No significant wavelength dependency was indicated with smaller (4.5') foveal stimuli and varying stimulus diameters in the periphery. Data taken with a dark surround exhibited more temporal summation than that taken with a light surround. Results are discussed in relation to evidence for differently sized receptive fields for the red and blue cones and for the rod receptors.

R 13

26,434

Das, S.R. & Sastri, V.D.P. SPECTRAL DISTRIBUTION AND COLOR OF TROPICAL DAYLIGHT. J. Opt. Soc. Amer., March 1965, 55(3), 319-323. (National Physical Laboratory, New Delhi, India).

The details of a study of the spectral energy distribution from 340 to 700 mμ of light from the northwestern sky at New Delhi, India, during the monsoon months of July, August, and September are given, along with a brief description of the salient features of the curves. The CIE color coordinates and the correlated color temperatures have been determined for all the curves. These and the results of earlier workers have been discussed in relation to the Abbot-Gibson curve and the E1-E2 curve of Henderson and Hodgkiss.

R 17

26,435

Thomas, J.P. BRIGHTNESS-CONTRAST EFFECTS AMONG SEVERAL POINTS OF LIGHT. J. Opt. Soc. Amer., March 1965, 55(3), 323-327. (Psychology Dept., University of California, Los Angeles, Calif.).

Simultaneous brightness contrast, or contrast enhancement, was studied using foveally viewed points of light as stimuli. Threshold and binocular brightness-matching techniques were used. When two stimuli are shown together, the presence of the second has two effects upon the brightness of the first: a) the brightness is augmented, as if by the addition of a proportion of the light from the second stimulus. The proportion declines with separation of the 2 stimuli; b) as stimulus intensity increases, brightness rises at a slower rate when the second stimulus is present. Effect b) eventually overbalances a). When 7 stimuli are shown together, the a) effects sum linearly. No clear pattern of summation is detected for the b) effects.

R 3

26,436

Holzworth, G.C. & Rao, C.R.N. STUDIES OF SKY-LIGHT POLARIZATION. J. Opt. Soc. Amer., April 1965, 55(4), 403-408. (Weather Bureau Research Station, Los Angeles, Calif. & Meteorology Dept., University of California, Los Angeles, Calif.).

The results of a series of systematic measurements of skylight polarization are presented and discussed. The measurements were made at Los Angeles during spring, 1963. A photoelectric skylight polarimeter employing ac light modulation has been employed in these measurements which were confined to the plane of the sun's vertical. 3 spectral intervals (bandwidth 150 Å) centered around 4000, 5100, & 6000 Å were studied. An attempt has been made to account for the departure of location and dispersion of the neutral points and the polarization maximum from the computed values for a purely molecular atmosphere in terms of the local turbidity. The effect of the variable reflectance of the ground on the magnitude of the polarization maxima has been included in these studies.

R 20

26,437

Luria, S.A. EFFECTS OF CONTINUOUSLY AND DISCONTINUOUSLY MOVING STIMULI ON THE LUMINANCE THRESHOLD OF A STATIONARY STIMULUS. J. Opt. Soc. Amer., April 1965, 55(4), 418-425. (USN Submarine Medical Center, Groton, Conn.).

The effects of a moving line of light on the luminance threshold of a stationary target in its path have been compared for continuous and interrupted movement with 3 luminances of the moving line (2.0 to 0.023 ft-L), 4 speeds (17° to 170°/sec), and 4 widths of interruption of movement about the target position (0.13° to 3.43°). For both the continuous and interrupted movement the target threshold generally varied: a) with the luminance of the line divided by its speed; and b) with the temporal interval between the presentation of the target and the arrival of the moving line at the target position. At short temporal intervals the rise in threshold with increasing luminance of the line was much greater than at long intervals. Although there were no substantial changes in the slopes of the functions, the point of maximum threshold rise was a function of speed. Both inhibitory and facilitative effects were magnified with very small interruptions of movement but decreased with larger interruptions.

R 16

26,438

Thomas, J.P. THRESHOLD MEASUREMENTS OF MACH BANDS. J. Opt. Soc. Amer., May 1965, 55(5), 521-524. (Psychology Dept., University of California, Los Angeles, Calif.).

Thresholds for Mach bands were obtained by filtering discontinuous luminance gradients until the bands disappeared. Visibility was related to 2 properties of the stimulus discontinuity at which the bands were seen: the change in the rate of change of luminance with respect to distance and the luminance at the discontinuity. The former clearly affects visibility. The latter also appears to affect visibility, but its influence was not always demonstrable. Light and dark bands are independently perceived. Light-band thresholds vary with exposure duration according to Bloch's law.

R 9

26,439

Thomas, J.G. USE OF A PIEZO-ACCELEROMETER IN STUDYING EYE DYNAMICS. *J. Opt. Soc. Amer.*, May 1965, 55(5), 534-537. (Engineering Dept., University College, Cardiff, Wales).

A small cantilever-type piezoelectric accelerometer has been fixed to a contact lens. By means of 1 or 2 electrical integrations of the amplified output voltage, angular acceleration, velocity, or displacement of the moving eye can be measured as functions of time. The sensitivity is high enough to record involuntary saccades and tremor during fixation; the bandwidth of the system under these conditions is 200 cps. The high sensitivity is maintained for all positions of the eye, so that during saccades and other fast eye movements, the fine detail, particularly of the small overshoots, can be examined. For study of the characteristics of the extraocular muscle-eyeball system, sinusoidal or transient eye movements caused by applying vibrational or step-like forces to the eye are recorded. These forces are applied by the action of an electromagnet on a piece of magnetic material fixed to the contact lens. Forced eye movements are also induced by applying either steady vibrations or impulsive forces to the head. 2 recording accelerometers are then used, 1 is on the contact lens, and the 2nd is fixed to a bite bar. Experiments have been made with human Ss and with dogs. Typical recordings are discussed.

R 14

26,440

Barakat, R. & Houston, Agnes. TRANSFER FUNCTION OF AN ANNULAR APERTURE IN THE PRESENCE OF SPHERICAL ABERRATION. *J. Opt. Soc. Amer.*, May 1965, 55(5), 538-541. (Itek Corporation, Lexington, Mass.).

The transfer function of an annular aperture in the presence of spherical aberration and defocusing is evaluated. The technique employed is the sampling method developed in a previous paper. The Maréchal aberration-balancing theory is extended to annular apertures. Representative numerical results are discussed.

R 9

26,441

Sperling, G. TEMPORAL AND SPATIAL VISUAL MASKING. I. MASKING BY IMPULSE FLASHES. *J. Opt. Soc. Amer.*, May 1965, 55(5), 541-559. (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).

Masking is defined as the change in threshold energy  $e_{th}^*(r)$  of a test stimulus T induced by a masking stimulus M of energy  $e_M$  as a function of the relative time r of occurrence. Masking is maximum when T & M occur simultaneously. A slight decrease in threshold for tests preceding the masking impulse by about 0.1 sec was explained as an alteration in appearance of the subsequent masking flash by a "subthreshold" test flash. Impulse-contrast threshold  $e_{th}^*/e_M$  was investigated for masking impulses M of 7 different energies superimposed on 5 backgrounds B. The increases in test threshold caused by M and by B were found to be independent and a modified Weber's law (adjusted contrast threshold  $C_{th}^* \approx 0.1$ ) held approximately. This conclusion was supported in a supplementary investigation of  $C_{th}^*$  using a category-rating-scale method. Impulse masking results were applied to predicting the masking peak at the onset of a long flash by treating the first 60 msec as an impulse. The lowering of thresholds of tests delayed in a long masking flash implied other detection mechanisms (e.g., temporal resolution). Theoretical predictions accounted for 94% & 97% of the variance in 2 relevant experiments, correctly predicting the effect of masking-flash duration and of background intensity. In both steady and intermittent light, masking is attributed primarily to fast processes (time constant  $\ll 1$  sec) which presumably have a neural rather than a photochemical basis.

R 46

26,442

Ikeda, M. & Boynton, R.M. NEGATIVE FLASHES, POSITIVE FLASHES, AND FLICKER EXAMINED BY INCREMENT THRESHOLD TECHNIQUE. *J. Opt. Soc. Amer.*, May 1965, 55(5), 560-566. (University of Rochester, Rochester, N.Y.).

On and off responses to a conditioning stimulus fluctuating between a primary adapting level of 2.7 ft-L and a secondary level of 0.3 ft-L are investigated using the increment-threshold technique. Single negative conditioning flashes (momentary diminution from 2.7 to 0.3 ft-L) are shown to yield discrete off and then on responses, even for flashes as short as 3 msec. Positive conditioning flashes, presented after a 17-msec diminution of the primary adapting level and followed by 57 msec at the secondary level, are also capable of generating discrete on and off responses, but only if longer than about 40 msec. Very short positive flashes produce little or no effect and are treated by the visual system as if they were part of a continuous dark interval. Flicker is investigated by presenting series of N negative conditioning flashes, with N varying from 2 to 5; increment thresholds obtained under these conditions are compared with those for a stimulus continuously fluctuating between the 2 levels at 29 cps. The results indicate that the visual system treats the flicker train to a considerable extent as it would a single negative flash, with a ripple superposed that is associated with all individual flashes in the train except the first positive flash, which is always ignored. It is tentatively suggested--pending further experimentation--that the responses to the individual flashes in a flicker train are neither on nor off responses; rather they may be responses to the integrated energy contained within each flash.

R 7

26,443

Siegel, M.H. COLOR DISCRIMINATION AS A FUNCTION OF EXPOSURE TIME. *J. Opt. Soc. Amer.*, May 1965, 55(5), 566-568. (USA Edgewood Arsenal Chemical Research & Development Labs., Edgewood Arsenal, Md.).

An experiment was performed to determine the effect of exposure time on color discrimination. 5 durations ranging from 0.02 to 5 sec were used. Discrimination continued to improve as exposure was lengthened. Some possible explanations for these results are offered.

R 28

26,444

Robertson, A.R. & Wright, W.D. INTERNATIONAL COMPARISON OF WORKING STANDARDS FOR COLORIMETRY. *J. Opt. Soc. Amer.*, June 1965, 55(6), 694-706. (Applied Optics Sec., Imperial College of Science & Technology, London, England).

This paper describes the results of an interlaboratory comparison of working standards made on behalf of Committee E-1.3.1. (Colorimetry) of the Commission Internationale de l'Eclairage. 30 laboratories from 15 different countries participated and spectral reflectance ( $\beta_\lambda$ ), luminous reflectance ( $\rho$ ), and chromaticity coordinates (x,y) were reported for 4 glossy ceramic tiles--near-white, light grey, dark grey, and near-black. The results have been analyzed in 2 groups depending on whether the illumination and light collection were directional or diffuse. A very considerable spread was found in each group of results, as well as a significant difference between the mean values of  $\beta$  in each group; the causes have been discussed. With a selected group of laboratories, however, the spread was very much smaller; use of calibrated white, grey, and near-black standards is recommended as a means of extending this agreement to laboratories which are not in a position to adopt all the refinements available to standardizing laboratories.

R 8

26,445

Billmeyer, F.W., Jr. PRECISION OF COLOR MEASUREMENT WITH THE GE SPECTROPHOTOMETER. I. ROUTINE INDUSTRIAL PERFORMANCE. J. Opt. Soc. Amer., June 1965, 55(6), 707-717. (Chemistry Dept., Rensselaer Polytechnic Institute, Troy, N.Y.).

A round-robin study of color measurement on the General Electric recording spectrophotometer was carried out by 15 participating laboratories, using transparent glass filters and opaque plastic and glass specimens. In terms of CIE Y & x, y for Illuminant C (daylight), 95% confidence limits for individual measurements averaged  $\pm 1.5\%$  for Y and  $\pm 0.0165$  for x & y if all the data were included. Elimination of results known or suspected to contain systematic errors reduced these values to  $\pm 0.57\%$  for Y and  $\pm 0.0119$  for x & y. The confidence limits for x & y are much greater for low-luminance than for high-luminance specimens, but those for Y showed relatively little dependence on luminance. The short-time repeatability of the spectrophotometer averaged  $\pm 0.09\%$  for Y and  $\pm 0.0007$  for x & y, while its reproducibility over a 14-month period averaged  $\pm 0.62\%$  for Y and  $\pm 0.0028$  for x & y. The results of this round-robin study clearly show, as in the repeatability and reproducibility studies, that the GE spectrophotometer, when suitably calibrated and operated, can still be considered the referee instrument for accurate color measurement. Serious doubt is cast, however, on the suitability of the procedures generally practiced for the calibration and operation of this instrument.

R 19

26,446

Guth, S.L. LUMINANCE ADDITION: GENERAL CONSIDERATIONS AND SOME RESULTS AT FOVEAL THRESHOLD. J. Opt. Soc. Amer., June 1965, 55(6), 718-722. (Psychology Dept., Indiana University, Bloomington, Ind.).

A rationale and methodology is developed which allows the systematic and definitive testing of a scalar luminance-additivity law (Abney's law) within any photometric system which operationally defines luminance equality. For example, under the postulate that all stimuli have the same luminance at absolute threshold, the following inference is made: If a sub-threshold field of  $\lambda_c$  is set so that it is some proportion  $p$  of the energy required to bring itself to a just-visible level, then the energy of any other wavelength  $\lambda_i$  which must be added to the same  $\lambda_c$  subthreshold field in order to bring the  $\lambda_c + \lambda_i$  mixture to threshold should be the proportion  $1 - p$  of the energy required to bring  $\lambda_i$  to threshold when no mixing is involved. In an experiment concerned with such mixtures, it is found that a scalar additivity law does not even approximate the facts of luminance addition at threshold, with complete failure of additivity being apparent under some conditions. Moreover, the data suggest the presence of an inhibitory effect in which a light is less visible when combined with subthreshold light of a different wavelength than when presented alone.

R 7

26,447

Alpern, M., Thompson, S. & Lee, M.S. SPECTRAL TRANSMITTANCE OF VISIBLE LIGHT BY THE LIVING HUMAN EYE. J. Opt. Soc. Amer., June 1965, 55(6), 723-727. (Ophthalmology Dept., University of Michigan, Ann Arbor, Mich.).

The ocular media transmit different amounts of visible light depending on wavelength. The magnitude of this transmission can be estimated by reflecting a monochromatic beam of light off the inside of the sclera of a living eye which has an anomalous absence of choroid and retina. Measurements of this kind on 3 living human eyes are in good agreement with previous transmittance estimates based on in vitro spectrophotometry of enucleated eyes.

R 7

26,448

Curran, C.S. & Thomas, R.H. APPARATUS FOR LUMINANCE-THRESHOLD DETERMINATION IN ANIMALS. J. Opt. Soc. Amer., June 1965, 55(6), 727-728. (Merck Institute for Therapeutic Research, West Point, Penn.).

A simple apparatus for determining luminance thresholds in animals is described. A General Electric electroluminescent lamp is used as the light source, since its luminance can be varied over many decades electrically while its spectral distribution remains invariant. The luminance of the lamp is varied over a 7-decade range in logarithmic increments by an add-subtract-type stepping switch. Programmed pulses to the stepper increase the luminance; animal responses provide pulses to reduce luminance. A method of calibrating the light source with an Aminco photomultiplier microphotometer is described.

R 1

26,449

Schreuder, D.A. CONTRAST SENSITIVITY IN TEST FIELD WITH BRIGHT SURROUND. J. Opt. Soc. Amer., June 1965, 55(6), 729-731. (Lighting Laboratory, Philips, Eindhoven, The Netherlands).

A set of curves and 2 empirical formulas have been derived which represent the contrast sensitivity of the human eye when both the test-object and the test-field luminances are considerably lower than the adaptation level. Although derived to be used for the lighting of traffic tunnels, the data may be applied to a much wider range of visibility problems, as the results are not greatly dependent on changes in the experimental conditions.

R 1

26,450

Kinney, Jo Ann S. EFFECT OF EXPOSURE TIME ON INDUCED COLOR. J. Opt. Soc. Amer., June 1965, 55(6), 731-736. (USN Submarine Medical Center, Medical Research Lab., Groton, Conn.).

The colors induced into neutral fields of either Illuminant A or C by 4 surround colors: red, green, yellow, or blue, were determined for various exposure durations, ranging from 50 to 400 msec. The induced color was compared, using a binocular septum technique, with a field of colored light that could be varied in hue, saturation, and brightness. The effects of exposure time differed for the 4 inducing colors; red and blue have the most different effects. As the exposure time was lengthened, increasing saturations of green were induced by red while decreasing saturations of yellow were induced by blue.

R 14

26,451

Weissman, S. EFFECTS OF LUMINANCE ON THE PERCEPTION OF RED AND GREEN AT VARIOUS RETINAL POSITIONS. J. Opt. Soc. Amer., July 1965, 55(7), 884-887. (USN Medical Research Lab., New London Submarine Base, Groton, Conn.).

The red-green ratios corresponding to the perception of red or green were determined by use of the method of constant stimuli. At 3 luminance levels (0.3, 0.1, & 0.01 ft-L), measurements were made with a 1° stimulus centered foveally, and at 2°, 6°, 10°, 14°, & 18° along the upper vertical meridian. At the 2 highest luminance levels, red sensitivity as measured by red-green ratios appeared constant from 2° to 14° and then decreased at 18°. Green sensitivity remained much the same from 2° to 10° and then dropped off sharply. At the lowest luminance level, green sensitivity was lost completely beyond 2° and there was a progressive decrease in red sensitivity as the peripheral angle increased. With decreasing luminance and increasing peripheral angle, variability of the red-green ratios required for the perception of red and green increased.

R 7

26,452

Matteson, H.H. & Luria, S.M. COLOR-MIXTURE FUNCTIONS WITH A WHITE DESATURANT. J. Opt. Soc. Amer., July 1965, 55(7), 887-892. (USN Submarine Medical Center, Groton, Conn.).

Color-mixture functions were obtained: a) with the traditional method of using 1 of the 3 primaries to desaturate the test wavelength; and b) by desaturating with a broadband white light. 3 normal trichromats made monocular, foveal color matches to wavenumbers from 2300 to 1500 mm<sup>-1</sup> in 50 mm<sup>-1</sup> increments using primaries of 2177 mm<sup>-1</sup> (459.3 mμ), 1900 (526.3), & 1550 (645.2), with a 2° test field at a luminance of about 1.0 mL. The most prominent differences were that the amounts of all 3 primaries needed to match test stimuli below the blue primary (2200-2300 mm<sup>-1</sup>) were less with the white desaturant, as was the negative-red lobe between the blue and green primaries. The dominant wavelengths of the test stimuli at the match points were compared for the 2 conditions, and comparisons were made between the changes under these conditions and the differences in the CIE 2° and 10° CMFs, foveal and parafoveal CMFs, and changes resulting from reduction in luminance.

R 7

26,453

Wheeler, L. MODIFICATION OF INDUCED-HUE RESPONSES BY MEANS OF FORCED MATCHING. J. Opt. Soc. Amer., Aug. 1965, 55(8), 1020-1023. (California State College, Hayward, Calif.).

Induced-hue matching responses are shown to be subject to a learning or conditioning effect. Munsell matches were made to a series of mixtures of red and tungsten light, viewed as test patches in a surround of the same 2 lights. Systematic forcing of the matches, during practice trials, produced modifications of the matching responses on test trials. Forcing consisted of restricting the Munsell hue ranges from among which the matches were made, but forcing was not extreme; it represented an abstract version of the responses of previous Ss to a similar set of stimuli. 6 forced-match and 6 control Ss made 2592 matches, 864 from the critical pre- and post-forcing trials. In the forced-match group a strong blue or purple-blue component was added to nearly all hues. In each group, Munsell-value responses reflected the relative luminances of the stimuli, but tended to decrease slightly as a function of practice. Munsell-chroma responses were bimodally distributed and showed little change from early to late trials. Because of the experimental design, the hue shifts in the forced-match group are regarded as learning phenomena.

R 6

26,454

Wolf, E. & Morandi, A.J. SENSITIVITY OF THE BLIND-SPOT REGION TO STIMULATION BY FLICKER. J. Opt. Soc. Amer., Aug. 1965, 55(8), 1024-1028. (Retina Foundation Ophthalmology Dept., Massachusetts Eye & Ear Infirmary, Boston, Mass. & Harvard Medical School, Boston, Mass.).

Flicker functions were obtained with square test fields of 1°, 2°, 5°, and 10° angular sub-tense positioned at the center of the blind spot. When the test fields fell entirely on to the disk, duplex flicker curves were obtained, indicating excitation of adjacent elements by scatter of light. The disk area was explored with small test fields presented in various positions on a vertical and a horizontal line running through the center of the blind spot. A drop in critical flicker frequencies was obtained when the test field fell into the disk area. The possibility of using the decrease in frequency as a measure of retinal dysfunction in scotomata is discussed.

R 7

26,455

Beck, J. ACCOMMODATIVE ASTIGMATISM AND PATTERN ACUITY. J. Opt. Soc. Amer., Sept. 1965, 55(9), 1139-1142. (Psychological Labs., Harvard University, Cambridge, Mass.).

Visual acuity for vertical and horizontal lines on targets containing both was found to be unequal, though there was no detectable astigmatism in the unaccommodated eye. This difference in acuity, which tends to favor the vertical lines, is a function of accommodation and is affected systematically by changes in the vergence of the light rays. The findings suggest that the observed asymmetry in acuity resulted from a vertical-horizontal astigmatism produced by accommodation. Thus, the absence of detectable astigmatism in the unaccommodated eye is not sufficient to rule out dioptric factors as a cause of the often-reported effects of orientation on pattern acuity.

R 9

26,456

Green, D.G. & Campbell, F.W. EFFECT OF FOCUS ON THE VISUAL RESPONSE TO A SINUSOIDALLY MODULATED SPATIAL STIMULUS. J. Opt. Soc. Amer., Sept. 1965, 55(9), 1154-1157. (Physiological Lab., University of Cambridge, Cambridge, England).

The recent development in the use of sinusoidal gratings for the analytical study of optical systems has been applied to the effects of focus and pupil aperture on visual resolution. For an eye with a dilated pupil, the in-focus position is shown to depend upon the spatial frequency of the test target. The effective refractive power of the eye increases for the detection of low-frequency gratings. If the eye is corrected for this change in effective refractive power, an improvement of about 70% in contrast sensitivity occurs for low spatial frequencies. The implications of these findings on the phenomenon of "night myopia" are discussed.

R 8

26,457

Steinman, R.M. EFFECT OF TARGET SIZE, LUMINANCE, AND COLOR ON MONOCULAR FIXATION. J. Opt. Soc. Amer., Sept. 1965, 55(9), 1158-1165. (Psychology Dept., University of Maryland, College Park, Md.).

A contact-lens technique was used to record eye movements made by 2 Ss attempting to maintain fixation at the center of concentric round targets of several sizes (1.9'-87.2' diam) and luminances (2.8, 7.8, & 21.5 mL). Fixation of red, blue, and white 1.9'-diam targets was also examined. ANOVA designs were employed to remove variability arising from sources other than these stimulus variables. Statistically reliable differences in mean fixation position were found with targets of different size, luminance, and color. The largest difference observed was less than 4' and under most conditions was less than 2'. The bivariate dispersion of the eye about its mean position varied in a complex manner with the size and luminance of the target object. No statistically reliable effects of stimulus variables were found on drifts. Saccade frequency was considerably reduced with the largest targets. Results are discussed in terms of a "fixed error-signal system" for the control of eye position.

R 11

26,458

Wyszecki, G. & Wright, H. FIELD TRIAL OF THE 1964 CIE COLOR-DIFFERENCE FORMULA. J. Opt. Soc. Amer., Sept. 1965, 55(9), 1166-1174. (Applied Physics Div., National Research Council, Ottawa, Canada).

New and recently published data, comprising a total of approximately 30,000 judgments (ratio and paired comparisons) made by several Os on 176 pairs of colors, are used to check the 1964 CIE color-difference formula. The results indicate that the formula predicts observed color difference, ranging from about 4 to about 60 CIE units, with reasonable accuracy. Approximately 90% of the observed differences are predicted correctly to within  $\pm 25\%$ . The precision of the observed differences is estimated to be also about  $\pm 25\%$ . It has been noticed that several pairs (about 20 out of 100) have predicted color differences deviating significantly from the observed differences. Observations are affected by the luminous reflectance of the achromatic surround, but the deviations between color differences observed with a white surround and color differences observed with a black surround are masked somewhat by the limited precision of the observations, and thus, in the average, the CIE formula predicts both cases equally well.

R 7

26,459

Merchant, J. SAMPLING THEORY FOR THE HUMAN VISUAL SENSE. J. Opt. Soc. Amer., Oct. 1965, 55(10), 1291-1295. (Honeywell Radiation Center, Boston, Mass.).

The subject of this paper is the nature of the sampling operation performed by the human visual sense, restricted to black and white, nonstereoscopic, photopic vision. The hypothesis is presented that the human visual sense samples the spatial "power" spectrum (The term spatial power spectrum is used throughout to describe the absolute value of the square of the Fourier spatial transform of the image, although it is recognized that the word "power" is, strictly, a misnomer in this context. It is to be particularly noted that the word spectrum does not, here, refer to the electromagnetic frequency spectrum of the radiation associated with the image but to the spatial frequency spectrum of the pattern structure of the image.) of the input image, just as the aural sense samples the temporal power spectrum of the input sound. The justification for this hypothesis is the fact that the sensitivity of the retina (except at the fovea) to form, or pattern, in the input image is very much poorer than is suggested by the corresponding upper cutoff spatial frequency of the retina. This property is characteristic of power-spectrum sensitive devices. A physical model retina is described that could perform the hypothesized spectral-sampling operation.

R 2

26,460

Cornsweet, T.N. & Teller, David A. RELATION OF INCREMENT THRESHOLDS TO BRIGHTNESS AND LUMINANCE. J. Opt. Soc. Amer., Oct. 1965, 55(10), 1303-1308. (University of California, Berkeley, Calif.).

Under ordinary conditions, both the brightness and the increment threshold of an illuminated disk vary directly with its luminance. However, when the disk is surrounded by an annulus more intense than the disk, the brightness of the disk decreases while its luminance remains unchanged. This set of experiments was performed to determine whether, when brightness of the disk, or upon luminance, the increment threshold depends upon the luminance or upon the brightness of the disk, or upon both factors. We measured the increment threshold for a flash added to the center of a large illuminated disk when the disk was surrounded by a contiguous annulus whose luminance could be varied. Measurements were also taken of the increment threshold as a function of time after the onset of the annulus. Correcting for light scattered in the eye, we found the increment threshold under all conditions to be independent of the luminance of the annulus (and thus independent of the brightness of the region), and dependent only upon the retinal illuminance of the region to which the test flash was added. It is concluded that brightness and the increment threshold cannot depend upon the same properties of the visual system.

R 17

26,461

Das, S.R. COMPARATIVE EVALUATION OF THE COLOR MATCHING FUNCTIONS. J. Opt. Soc. Amer., Oct. 1965, 55(10), 1309-1313. (National Physical Laboratory, New Delhi, India).

In the 1st part of the paper, a field trial is made with a large size photometer, the 2 halves of which are illuminated by fluorescent and tungsten lamps, respectively, to test the agreement between the observed chromaticities and the chromaticities predicted from spectroradiometric data on the basis of 4 sets of color matching functions: a) the CIE 1931 Standard Observer; b) Stiles's 2° pilot data; c) the CIE 1951 proposed modified data; and d) the CIE 1963 Supplementary Observer for 10° field. The results indicate a poor correlation by the supplementary O. In the 2nd part, a similar comparative study is made by an evaluation of the chromaticity differences, on the basis of both MacAdam's standard-deviation ratio and separation in the UCS diagram, between 26 near-white wool surfaces. The supplementary O seems to have a lower discrimination than the others.

R 29

26,462

Friele, L.F.C. FURTHER ANALYSIS OF COLOR DISCRIMINATION DATA. J. Opt. Soc. Amer., Oct. 1965, 55(10), 1314-1319. (Vezelinstituut T.N.O., Delft, The Netherlands).

A formula for color discrimination data is based on a green primary at  $x=-2.6$ ,  $y=3.6$ , a red primary at the end of the spectrum locus and a blue primary at  $x=0.1634$ ,  $y=0$ . The formula is modeled on the Müller theory; several adjustable parameters are evaluated from data on precision of color matching and from various color-tolerance data, including the official Dutch flag colors. Representative values are recommended for various conditions and purposes.

R 15

26,463

Wyszecki, G. MATCHING COLOR DIFFERENCES. J. Opt. Soc. Amer., Oct. 1965, 55(10), 1319-1324. (Applied Physics Div., National Research Council, Ottawa, Canada).

A new visual colorimeter has been designed and built to be used primarily for matching color differences. The colorimeter provides 7 visual fields, arranged in a cluster of 7 regular hexagons, 1 in the center and 6 adjacent to it. Both eyes of the O see each field uniformly filled with light. The color of each field is a mixture of 3 primary lights (red, green, blue) and can be controlled by the O independent of the color of the other fields. Depending on the nature of the experiment, the O can be presented with all 7 fields in operation or with some fields switched off. The colorimeter is calibrated to convert instrumental readings to CIE color coordinates. The 1st experiment performed with the colorimeter was to assess quantitatively the ability of the O to make matches of color difference in an array of 3 adjacent fields of constant brightness. Fixing the colors of 2 fields, the O was required to produce a color in the 3rd field so as to form a perceptually equilateral triangle of colors of constant brightness. The repeatability of such matches is presented graphically in the 1960 CIE-UCS diagram.

R 10

26,464

Wolf, E. & Zigler, M.J. EXCITATION OF THE PERIPHERAL RETINA WITH COINCIDENT AND DISPARATE TEST FIELDS. J. Opt. Soc. Amer., Nov. 1965, 55(11), 1517-1519. (Clinical Eye Research Dept., Retina Foundation, Boston, Mass. & Visual Research Lab., Wellesley College, Wellesley, Mass.).

Rectangular test fields  $1/2^\circ \times 2^\circ$ , with long dimension horizontal and vertical, were presented  $10^\circ$  from fixation on the horizontal and vertical meridian of the visual field. Threshold luminances were determined for each eye singly, and for both eyes when the retinal images were coincident or disparate. In the lateral visual field, binocular thresholds for coincident images were lower than when they were disparate. On the vertical meridian, binocular summation of coincident images is insignificant or totally absent. If, however, in this retinal location the images are disparate and the image in 1 eye falls to 1 side of the median line, summation occurs. It is thought that binocular summation is a function of the transmission of impulses from both eyes to the same cortical area of the same cerebral hemisphere.

R 5

26,465

Schober, H.A.W. & Miller, U.M. MEASUREMENT OF MUSCLE TREMOR ASSOCIATED WITH HAND-HELD FIELD GLASSES. J. Opt. Soc. Amer., Nov. 1965, 55(11), 1520-1527. (Medical Optics Institute, University of Munich, Munich, West Germany).

Muscle tremor limits the resolution of hand-held field glasses. All mechanical or optical compensations of tremor movements depends on its spectral frequency distribution. In this paper, the spectral frequency distribution was recorded for 22 emmetropic Os between 18 & 36 yrs. of age. Only tremor frequencies less than 20 cps are of practical importance. The frequency spectrum is a characteristic of the single O. The position of his individual peaks remains constant for a period of more than 1 yr. The most usual frequency maxima are in the ranges 1.3-1.7, 2.7-3.5, & 6-11 cps. Other factors, such as weight and shape of the instrument, luminance level, and structure of the visual field, are of less significant influence.

R 4

26,466

Ikeda, M. TEMPORAL SUMMATION OF POSITIVE AND NEGATIVE FLASHES IN THE VISUAL SYSTEM. J. Opt. Soc. Amer., Nov. 1965, 55(11), 1527-1534. (Minolta Camera Research Lab., Daisen-Nishimachi, Sakai, Japan).

Temporal summation characteristics of the human eye have been studied by various authors by measuring the increment threshold when 2 test stimuli are presented successively. Among other things, some have observed an inhibition between the effects of 2 flashes for a certain inter-flash interval and others have not. Here a similar experiment is carried out with a red test stimulus superposed upon a red adapting field. Inhibition is observed at an interval of 52 or 70 msec, depending on the adapting level. Such an inhibition is also found when 2 stimuli are both negative. The introduction of a negative test stimulus into the double-flash, increment-threshold technique is a new aspect of the present work. Some new phenomena are observed, particularly, that a positive and a negative flash summate with each other at the interval where double positive or double negative flashes yield inhibition. The luminance ratio of the 2 stimuli (positive or negative) was freely adjusted and new information concerning the linearity of the summation was obtained. Based on these findings, hypothetical response-potential functions have been derived, which are assumed to be responses in the visual system at some peripheral level.

R 10

26,467

Hunt, R.W.G. MEASUREMENT OF COLOR APPEARANCE. J. Opt. Soc. Amer., Nov. 1965, 55(11), 1540-1551. (Research Laboratories, Kodak Ltd., Middlesex, England).

An instrument has been constructed in which colors seen under various conditions by direct viewing by the left eye can be matched for color appearance by adjusting the proportions of red, green and blue mixture seen by the right eye in the center of an adapting field of 1000 ft-L at a color temperature of 4000°K. The instrument has been used for measuring the appearance of the colors of a chart under various viewing conditions ranging from bright sunlight out of doors to ordinary tungsten room lighting. It was found that adaptation only partially corrected for changes in the color and intensity of adapting illuminations, and, in addition, colors lost saturation markedly as the adapting intensity was lowered. It was also found that, if viewed by tungsten light in a dark room, a color reproduction having the same spectral reflectance curves as the original would appear to be appreciably more orange, darker, and less saturated than the original when viewed in sunlight.

R 39

26,468

Wright, H. PRECISION OF COLOR DIFFERENCES DERIVED FROM A MULTIDIMENSIONAL SCALING EXPERIMENT. *J. Opt. Soc. Amer.*, Dec. 1965, **55**(12), 1650-1655. (Applied Physics Div., National Research Council, Ottawa, Canada).

A multidimensional ratio-scaling method was used to analyze 1 observer's color difference judgments made on 2 sets of colored tiles of equal luminous reflectance. The precision of the observed color differences was found to be approximately  $\pm 30\%$ . Taking this precision into account, the analysis indicated that all colors could be represented by points in a 2-dimensional Euclidean space in which distances between 2 points were proportional to observed color differences independent of the location of the points. A method involving relatively simple computations is used to derive the perceptual space for a large group of colors by dividing the group into several subgroups and then overlapping the scaling solutions obtained for each subgroup.

R 14

26,469

Lewis, M.F. CATEGORY JUDGMENTS AS FUNCTIONS OF FLASH LUMINANCE AND DURATION. *J. Opt. Soc. Amer.*, Dec. 1965, **55**(12), 1655-1660. (Columbia University, New York, N.Y.).

A method for obtaining suprathreshold, constant-response functions from category judgments was developed and illustrated by obtaining judgments for flashes of varying luminance and duration in the fovea. The contours show agreement with Bloch's law; no Braca-Sulzer effect was obtained. A second experiment indicated that the method is sensitive to context effects. No reliable variation in the critical duration was found with changes in luminance level.

R 12

26,470

Miller, Norma D. VISUAL RECOVERY FROM BRIEF EXPOSURES TO HIGH LUMINANCE. *J. Opt. Soc. Amer.*, Dec. 1965, **55**(12), 1661-1669. (Optometry School, Ohio State University, Columbus, Ohio).

The Maxwellian-view optical system provided a circular flash field of  $10^\circ$  diam, and at the peak of the flash, the field luminance was  $5.4 \times 10^5$  L. A rotating-mirror shutter system permitted flash durations of 1.4 to 0.64 msec with constant pulse shapes for all durations. The maximum flash energy was  $4 \times 10^7$  td-sec or  $0.042$  cal/cm<sup>2</sup> at the retina, neglecting losses in the ocular media. With the infrared removed by filtering the beam, the maximum energy was reduced to  $3 \times 10^7$  td-sec or  $0.012$  cal/cm<sup>2</sup>. The criterion measure for visual performance following the flashes was the identification of Sloan-Snellen letters of different sizes. The letters were transilluminated with luminances from 130 to 0.03 mL. The effect of removing the infrared portion of the flash radiance on the recovery times for a given level of visual performance was tested and found negligible. The other variables studied were the size of the flash field and the duration of the flash. The time course of recovery following various flash energies was investigated by varying the letter size and the letter luminances.

R 5

26,471

Davies, J.M. & Levine, A. INFRARED IMAGE-CONVERTER METHOD OF OBSERVING EYE MOTION IN FLASH BLINDNESS EXPERIMENTS. *J. Opt. Soc. Amer.*, Dec. 1965, **55**(12), 1670-1671. (USA Natick Labs., Pioneer Research Div., Natick, Mass.).

An infrared image converter is proposed for observing eye motion in experiments in which the optokinetic nystagmic reflex motion is used to indicate recovery of vision after flash blinding. Illumination is provided by an incandescent lamp with a filter which transmits only above  $0.9 \mu$ . One experiment was performed on a single human S, using a photoflash lamp for the blinding light and a faint moving light for the test pattern. For exposures up to  $0.017$  J cm<sup>-2</sup> the duration of blindness increased linearly with exposure. The durations determined by the S and by the observer agreed very well.

R 5

26,472

Boynton, R.M., Scheibner, H., Yates, T. & Rinalducci, E. THEORY AND EXPERIMENTS CONCERNING THE HETEROCHROMATIC THRESHOLD-REDUCTION FACTOR (HTRF). *J. Opt. Soc. Amer.*, Dec. 1965, **55**(12), 1672-1685. (University of Rochester, Rochester, N.Y.).

Selective chromatic adaptation occurs when a change in spectral distribution and/or luminance of an adapting field alters the sensitivity of the eye (as measured by the reciprocal threshold of superposed test flashes) differentially with respect to wavelength of the test stimuli. A convenient test of selective chromatic adaptation is to measure homochromatic (e.g., red on red) and heterochromatic (e.g., red on green) thresholds for 2 different relative spectral distributions, each being used in a conditioning field as well as in a test flash. An index  $\bar{\eta}$  is defined by the sum of the 2 homochromatic thresholds minus the sum of the 2 heterochromatic thresholds, where all values are expressed in log units. This index expresses the factor by which the heterochromatic thresholds are lower than the homochromatic ones (the heterochromatic threshold-reduction factor or HTRF). It is shown that  $\bar{\eta}$  must equal zero for an eye having only 1 class of spectrally selective mechanism; data obtained under scotopic conditions are presented to verify this conclusion. It is also shown that if  $\bar{\eta}$  is significantly different from zero, more than 1 class of mechanism must have contributed to the threshold response, and further that these 2 or more classes of mechanisms have been selectively adapted. Data are also presented to illustrate such selective adaptation where  $\bar{\eta}$  has been measured at photopic levels as a function of field luminance and spectral separation between stimuli being compared.

R 12

26,473

Bird, G.R. & Jones, R.C. ESTIMATION OF THE SPECTRAL RESPONSE FUNCTIONS OF THE HUMAN CONE PIGMENTS. *J. Opt. Soc. Amer.*, Dec. 1965, **55**(12), 1686-1691. (Research Labs., Polaroid Corporation, Cambridge, Mass.).

In this paper we seek linear combinations of the CIE-1931 Standard Observer tristimulus functions that could plausibly relate to action spectra of organic dyes. It turns out that this simple criterion yields an almost unique determination of the fundamental response functions of the human cone pigments. The results are in good agreement with those obtained by radically different methods. Just because each of the methods of obtaining the fundamental response functions has its own uncertainties and assumptions, it is important to use as many different approaches as possible, and then to interrelate them. Our method shares with the other methods the limitation that the red response function is the least well-determined. The 3 fundamental response functions determined in this paper are for the  $2^\circ$  (foveal) field and are defined by  $R(\lambda) = 0.901\bar{x}(\lambda) + 0.247\bar{y}(\lambda) - 0.148\bar{z}(\lambda)$ ;  $G(\lambda) = -0.508\bar{x}(\lambda) + 1.409\bar{y}(\lambda) + 0.099\bar{z}(\lambda)$ ;  $B(\lambda) = \bar{z}(\lambda)$ . Certain minor deficiencies in the CIE-1931 color functions are emphasized by our examination. These deficiencies are related to the smoothing of the very real fine structure in the blue region.

R 16

26,474

Lobanova, N.V. POSSIBLE FORMS OF COLOR VISION. Optics & Spectroscopy, July 1965, XIX(1), 66-67. (USSR Academy of Sciences, Moscow, Russia).

According to the scheme proposed in this article, there exist, in all, ten forms of color vision. Data on normal trichromats, on anomalous trichromats (i.e., protanomals, deuteranomals, and tritanomals), and also on normal dichromats (i.e., protanopes, deuteranopes, and tritanopes) exist in more or less sufficient quantity. The behavior of persons who have any of these 7 forms of color vision is known when they are measuring color on ordinary visual colorimeters, when they are studied on anomaloscopes, and simply under natural conditions. The spectral-sensitivity curves of the receptors of the eye have been determined for almost all of them with greater or lesser reliability, and everything that is known about them does not contradict the assumption that there are, in all, 4 types of cone receptors in the retina. With regard to the last 3 forms of color vision, i.e., the forms which are characteristic of anomalous dichromatism, there have only been 2 suggestions about their existence. If we assume that anomalous dichromatisms actually exist, then it is necessary to state that existing methods and instruments are insufficient for their observation. Proceeding from the hypothesis that there are only 4 spectral-sensitivity variants for the receptors of the eye, a scheme of possible forms of color vision is proposed.

R 10

26,475

Swope, C.H. & Koester, C.J. EYE PROTECTION AGAINST LASERS. Applied Optics, May 1965, 4(5), 523-526. (American Optical Company, Southbridge, Mass.).

From published data on threshold dosage for an observable retinal lesion, calculations were made on the attenuation required to protect the human eye against pulsed laser radiation. Several highly attenuating filters were evaluated in terms of the maximum laser energy against which they provide protection. Because of their very high absorption, some of the filters were found to break or craze at relatively low energies. A solution to this problem which provides eye protection against an Nd-doped glass laser delivering up to 740 J in an impact area 5 mm in diameter on the filter is described. Suggestions are made for protecting the eyes of personnel working with lasers: a) never look into a laser beam either direct or reflected; b) wear laser eye protective glasses or goggles; c) contain the laser beam as much as possible by using light traps; d) be examined periodically by an ophthalmologist trained in photocoagulation; e) avoid the use of highly reflecting surfaces as much as possible.

R 6

26,476

Donaldson, W.A. THE ESTIMATION OF THE MEAN AND VARIANCE OF A "PERT" ACTIVITY TIME. Operations Research, May-June 1965, 13(3), 382-385. (Industrial Administration Dept., University of Strathclyde, Glasgow, Scotland).

An alternative method of estimating the variance of a PERT activity time is proposed given that 1 of the initial estimates is the mean. The beta-distribution of the activity time is assumed to be tangential to the x-axis at each end. Restrictions in the current method are relaxed, and the inconsistency of the implicit assumption of a fixed coefficient of skew removed. The skew of the distribution is determined by the 3 estimates of the activity time. No difficult computations are involved.

R 4

26,477

Brenner, M.E. A RELATION BETWEEN DECISION MAKING PENALTY AND SIMULATION SAMPLE SIZE FOR INVENTORY SYSTEMS. Operations Research, May-June 1965, 13(3), 433-443. (Bell Telephone Laboratories, Inc., Holmdel, N.J.).

The paper contains results from experiments in which 2 inventory models, with known analytical solutions have been simulated to learn about simulation. The author suggests a relation between the simulation sample size and the economic penalty for an incorrect decision from inaccuracy in the simulated information. The relation is  $\bar{W} = A/n^k$ , where  $\bar{W}$  is the average penalty in dollars,  $n$  is the sample size, and  $A$  and  $k$  are parameters obtained from a regression analysis. A series of results are reported with values given for  $A$  and  $k$ . The values of  $A$  vary monotonically with some of the inventory parameters. The values of  $k$  have moderate variability. It is hoped that the ideas suggested and the result presented may be helpful to others conducting experiments to learn more about simulation.

R 5

26,478

Hakimi, S.L. OPTIMUM DISTRIBUTION OF SWITCHING CENTERS IN A COMMUNICATION NETWORK AND SOME RELATED GRAPH THEORETIC PROBLEMS. Operations Research, May-June 1965, 13(3), 462-475. (Technological Institute, Northwestern University, Evanston, Ill.).

The concept of a median in a weighted graph is generalized to a multi-median. Then, it is shown that the optimum distribution of  $p$  switching centers in a communication network is at a  $p$ -median of the corresponding weighted graph. The following related problem in highway networks is also considered: What is a minimum number of policemen that can be distributed in a highway network so that no one is farther away from a policeman than a given distance  $d$ ? This problem is attacked by generating all vertex-coverings (externally stable sets) of a graph by means of a Boolean function defined over the vertices of a graph. Then this idea is extended to Boolean functions that generate all matchings, all factors, and all possible subgraphs of  $G$  with given degrees.

R 8

26,479

Mood, A.M. DIVERSIFICATION OF OPERATIONS RESEARCH. Operations Research, March-April 1965, 13(2), 169-178. (University of California, Los Angeles, Calif.).

This paper reviews areas in which operations research could make greater contributions. Education, health, welfare, agriculture, and urban affairs are the principal topics covered. (HEIAS)



26,480

Averch, H. & Wildhorn, S. SIGNALS, AMBIGUITY, AND STRATEGIC FORCE STRUCTURE. Operations Research, March-April 1965, 13(2), 179-190. (Rand Corporation, Santa Monica, Calif.).

In this paper we consider some problems that arise when a nation attempts to implement a strategy of stable deterrence over time. The problems arise when a nation's planners make strategic inferences based on an adversary's ambiguous signals of intent and action. A necessary condition for inferring an opponent's strategic objectives is good technical intelligence. We explore some alternative intelligence models and their effect on national response. It appears that even small improvements in the content and timing of intelligence information received by a nation pursuing stable deterrence would help constrain a noncooperative adversary and open new channels of communication.

R 1

26,481

Fox, P.D. A THEORY OF COST-EFFECTIVENESS FOR MILITARY SYSTEMS ANALYSIS. Operations Research, March-April 1965, 13(2), 191-201. (Stanford Research Institute, Menlo Park, Calif.).

This paper presents a theoretical basis for cost-effectiveness analysis. It is argued that, frequently, a range of effectiveness or cost levels may be acceptable to whoever must ultimately decide which military system (if any) should be acquired. The function of the analyst is to present a schedule of alternatives and not to optimize in the sense that he recommends the selection of a particular alternative. The formulation of the schedule is discussed where the cost and effectiveness associated with each alternative are viewed as random variables. The paper concludes with some general observations relating to military system selection.

R 7

26,482

Balas, E. SOLUTION OF LARGE-SCALE TRANSPORTATION PROBLEMS THROUGH AGGREGATION. Operations Research, Jan.-Feb. 1965, 13(1), 82-93. (Mathematics Institute, Rumanian Academy of Science, Bucharest, Rumania).

From a large-scale transportation problem (I) a smaller one (II) is derived by the aggregation of origins (destinations). A procedure is given to find an optimal solution  $\bar{X}$  to problem I, starting from an optimal solution  $\bar{Y}$  to problem II, and considering at each step only a small part of the original problem's data. While the proposed method is applicable to any transportation problem, its efficiency increases with: a) the size of the problem; and b) the unevenness of the territorial distribution of origins (destinations).

R 4

26,483

Fetter, R.B. & Thompson, J.D. THE SIMULATION OF HOSPITAL SYSTEMS. Operations Research, Sept.-Oct. 1965, 13(5), 689-711. (Yale University, New Haven, Conn.).

The product reported on here is concerned with developing approaches to problems in the design and utilization of hospital facilities. The objective is to provide hospital administrators with tools that will give them the ability to predict the operational consequences of alternative designs and, given any set of facilities, the results of the application of alternative policies for guiding the operation of these facilities. To this end, major effort has been devoted toward the construction of a set of simulation models that are descriptive of the essential features of various subsystems of a hospital. The consequence of this work so far has been the development of a laboratory in which some important questions of interest to hospital administrators may be attacked experimentally. It is the long-run goal to provide a comprehensive laboratory that will make possible the testing of a large variety of hypotheses concerning hospital design, organization, and operation.

R 2

26,484

Erlander, S. THE REMAINING BUSY PERIOD FOR A SINGLE SERVER QUEUE WITH POISSON INPUT. Operations Research, Sept.-Oct. 1965, 13(5), 734-746. (Stockholm University, Stockholm, Sweden).

Consider a single-server queuing process with Poisson input and general service time distribution. Define the remaining busy period  $\chi(t)$  as the time from a given instant  $t$  until the server becomes idle for the first time. Let  $y(t)$  be the number of customers in the system at time  $t$ . Let  $\chi_1(t)$  be the remaining service time for the customer being served at time  $t$ . In this paper we shall study the stochastic law of the remaining service time  $\chi_1(t)$  given that  $y(0)=i$  and  $y(t)=r$ . The result will then be applied to the problem of finding the joint distribution of the remaining busy period  $\chi(t)$  and the number of customers served during  $x(t)$  given that  $y(0)=i$  and  $y(t)=r$ .

R 5

26,485

Neuts, M.F. THE BUSY PERIOD OF A QUEUE WITH BATCH SERVICE. Operations Research, Sept.-Oct. 1965, 13(5), 815-819. (Purdue University, Lafayette, Ind.).

In this paper, we study the distribution of the busy period for a queue with Poisson input, in which the customers are served  $m$  at the time if there are  $m$  or more present and all at once if there are less than  $m$  present. We show that the busy period is equal to the time between successive visits to the state 0 in an imbedded semi-Markov process, associated with the queuing process. Extending an argument of L. Takacs for the  $M/G/1$  queue, we obtain the transform of the distribution of the busy period. Explicit expressions in real time may in principle be obtained, using Lagrange's expansion.

R 5

26,486

Chang, W. PREEMPTIVE PRIORITY QUEUES. Operations Research, Sept.-Oct. 1965, 13(5), 820-827. (IBM Corporation, Kingston, N.Y.).

Customers of different priorities arrive at a counter in accordance with a Poisson process. The customers are served by a single server in order of priority and for each priority in order of arrival. Preemptive discipline is assumed. 3 service policies are considered: a) preemptive-resume; b) preemptive-repeat-identical; and c) preemptive-repeat-different. The time-dependent solutions for these priority systems are very complicated. However, the problem can be simplified in case of stationary solutions. In this paper, a step-by-step method is proposed to find the stationary distributions of the queue sizes, the waiting times, and the busy periods of each priority class.

R 10

26,487

Litsios, S. A RESOURCE ALLOCATION PROBLEM. Operations Research, Nov.-Dec. 1965, 13(6), 960-988. (Booz-Allen Applied Research, Bethesda, Md.).

In this paper 2 sequencing problems are investigated that arise in the course of allocating 1 or more constrained resources to 2 or more tasks. The general problem considered is 1 of determining the optimal sequence of tasks and the optimal scheduling of resource usage where the objective is to minimize the time by which all tasks are completed. The fundamental solution technique utilized involves a combination of dynamic programming and combinatorial analysis techniques. In the single resource case the 2 problems are shown to be graphical "duals" of each other thereby allowing an iterative solution to the 2nd problem.

26,488

Silver, E.A. BAYESIAN DETERMINATION OF THE REORDER POINT OF A SLOW MOVING ITEM. Operations Research, Nov.-Dec. 1965, 13(6), 989-997. (Arthur D. Little, Inc., Cambridge, Mass.).

Consider an inventory item for which the procurement (or production setup) lead time is nonzero. One of the commonly used methods of determining the reorder point of such an item is to specify the probability of a stockout or a desired service level (fraction of demand that is to be instantaneously satisfied) and then select the reorder level that will provide such service. However, such an approach has assumed that the probability distribution of demand during the lead time is exactly known. In many inventory situations this assumption is not justified, particularly in the case of a slow moving item with limited available sales history. For such a situation this paper explores the use of a Bayesian approach to selecting a reorder point.

R 3

26,489

Lifsey, J.A. OPTIMIZATION OF MAINTENANCE RESOURCES. Operations Research, Nov.-Dec. 1965, 13(6), 1007-1019. (Burroughs Corporation, Paoli, Penn.).

Dynamic programming techniques appropriate to optimizing a maintenance function are evaluated to demonstrate the feasibility of applying them to large-scale systems involving many equipments. The objective is to determine the proper number, mix, and level of military and/or contractor maintenance personnel, and to apportion expenditures on other maintenance resources, such as test equipment, computer programs, and manuals. The tasks to which the model was applied (drawn from comprehensive data on a developmental AF environment) considered maintenance of 15 digital display consoles, and used personnel, computer programs, computer manuals, procedural manuals (including circuit diagrams), and test equipment as the variable resources. The results yield the mix of resources that achieves a given mean-time-to-repair at minimum cost. Alternatively, the results can yield the trade-off of cost and mean-time-to-repair. Constraints on particular variables can be injected into the procedure and, in fact, have the effect of reducing required computer runs--but must be carefully restricted to those that realistically reflect the actual situation. The model not only realistically represents the maintenance function, but also can be readily expanded to other equipments by adding stages and data to the tables.

R 2

26,490

Chang, W. QUEUING WITH NONPREEMPTIVE AND PREEMPTIVE-RESUME PRIORITIES. Operations Research, Nov.-Dec. 1965, 13(6), 1020-1022. (IBM Data Processing Div, Kingston, N.Y.).

This paper considers a special queue situation, one in which a single facility serves 2 major priority classes of customers. Within each class, there are several levels of priorities. The first class has the higher priority. On arrival, a customer of the 1st class immediately replaces any customer of lower priority being served. The 2nd class has the lower priority, as compared to the 1st class. On its arrival, a customer of the 2nd class cannot interrupt the current service of a lower priority customer in the system; it must wait until the service is completed. The 1st class is the preemptive priority, and the 2nd class is the nonpreemptive priority. This paper formulates a theoretical solution for this queuing system, which has a wide range of application in the computer industry. The real-time control program under the multiprogramming environment is an analog of this priority queuing model.

R 9

26,491

Prien, E.P., Barrett, G. & Svetlik, B. USE OF QUESTIONNAIRES IN JOB EVALUATION. J. industr. Psychol., 1965, 3(4), 91-94. (University of Akron, Akron, Ohio).

The purpose of this study was to compare the prediction of current salary using a psychometric position-description questionnaire with the results obtained using a point-rating system applied to job specifications. The sample consists of 50 salaried supervisors in a medium-sized eastern manufacturing company. Examination of the results indicates that there is little relationship between the scores on the Supervisor Position Description Questionnaire Scale, and either the control variables or the principle variables of job difficulty level as measured by the conventional job evaluation, or salary. It would seem though that the function, Manufacturing Process Supervision is in some way related to these selected variables. The correlations indicate that those individuals who have greater responsibility for Manufacturing Process Administration are rated lower on effectiveness in personal relations and job competence tend to have lower rated job difficulty, and a lower salary. The reverse is true for the correlations between employee supervision and the same variables. The more responsibility for supervision the individual has, the higher are his ratings on effectiveness in personal relations, job competence; and this individual also has a higher total salary. It seems quite unlikely that the position description questionnaire approach will supplant the conventional job evaluation procedure in wage and salary administration. The very substantial difference in precision of predicting current salaries makes this obvious even though the possibility does exist that the current salary structure is entirely inappropriate. This is not a test of the validity of salary structures but merely an attempt to evaluate an alternative method of salary prediction.

R 2

26,492

Lemons, T.M. & Levin, R.E. NEW LIGHT SOURCES AND ASSOCIATED OPTICAL SYSTEMS FOR THEATRE AND TELEVISION. Illuminating Engng., Nov. 1965, LX(11), 637-649. (Sylvania Electric Products, Inc., Danvers, Mass.).

A summary of several important basic types of light sources is given. Of these types, the incandescent light source has been the workhorse of the theatre-television industry. Electroluminescent sources have provided an occasional special effect but are not generally used in this industry because of the low source brightness. Fluorescent lamps have been used in banks as large-area, low-brightness floods, especially in television lighting. Mercury lamps have met with little acceptance because of their color, restarting delay time, and nondimming properties. The new metallic-vapor lamp with its improved color and high efficiency can change this situation. The high-pressure xenon arc lamp is replacing carbon-arc sources in the projection and follow spot field. The major light source advancement for theatre-television has been in the incandescent family, namely, the quartz-iodine lamp.

R 5

26,493

James, W.G. TRANSPARENT COLOR COATINGS FOR OUTDOOR SIGN LAMPS. Illuminating Engng., Dec. 1965, LX(12), 688-690. (General Electric Co., Cleveland, Ohio).

Efforts to achieve higher colored lamp brightnesses have centered about the development of a suitable transparent colored coating for the bulb. The disadvantages and weaknesses of existing colored coatings is discussed. This paper reports an experiment in which a group of varied materials was coated on sign lamps of the 11S14 & 25A19 sizes. The lamps were operated horizontally on outdoor open racks. A cycle of 1/2 hr. on and 2 1/2 hr. off was used. Some of the materials tried had not previously been used as lamp coatings; others had been successful in other types of lamp applications. A 2-layer coating using a polycarbonate topcoat over an already useful lamp-coating material gave the best results. Retesting and evaluation against other materials showed a preference for the same 2-layer coating. High-brightness sparkle and distinct colors result from the use of the new coating. The polycarbonate clad combination has shown no failure after 3000/18,000 hr. of testing. (HEIAS)

26,494

Gee, D.L. & Humphreys, A.H. USER REVIEW OF CAMOUFLAGE FOR THE INDIVIDUAL COMBAT SOLDIER IN THE FIELD. APPENDIX D TO REPORT 1834. Task IM624101D46701, Oct. 1965, 91pp. USA Engineer Research & Development Labs., Fort Belvoir, Va. (AD 478675)

This appendix to HEIAS 27,605 presents an experimental design to provide reliable information as to the detectability of various combat uniforms in the field when observed by visual, photographic, near infrared, image intensifier, far infrared and radar detectors. The uniforms selected include the standard OG 107 as the control and several others, e.g., British, Khaki #1 without webbing, Marine Corps Mitchell Pattern without webbing, for evaluation as representative of the current state-of-the-art. The area selected for the study is open terrain covered with low grass and shrub growth (the most severe terrain). The detectors to be used cover the spectrum from the human eye to radar. 15 supplementary enclosures include experimental design objectives, aerial photographic observations, preliminary study details, 12-day and 12-night experiments, full moonlight experiment, simulated ambush and infiltration studies, color blind observers. (HEIAS)

26,495

Falls, H.B., Ismail, A.H., MacLeod, D.F., Wiebers, J.E., et al. DEVELOPMENT OF PHYSICAL FITNESS TEST BATTERIES BY FACTOR ANALYSIS TECHNIQUES. J. sports Med. phys. Fitness, Dec. 1965, 5(4), 185-197. (Physical Education Dept., Purdue University, Lafayette, Ind.).

Data pertaining to 53 physical fitness variables were collected from 89 adult Ss. 9 factors accounting for 77% of the total variance were isolated by factor analysis. The following names were given to the factors: a) Athletic Fitness; b) Maximum Metabolic Rate; c) Respiratory Capacity in Terms of Ventilatory Response to Submaximal Exercise; d) Basic Height of Blood Pressure; e) Heart Rate Response to Exertion; f) Expiratory Capacity; g) Pulse Pressure Response; h) Force Efficiency; and i) Resting Heart Rate. Multiple regression techniques were used to develop a test battery for each factor. The method of deriving a composite physical fitness criterion to be used in future studies was also discussed.

R 32

26,496

Kasch, F.W., Phillips, W.H., Carter, J.E.L., Ross, W.D., et al. MAXIMUM WORK CAPACITY IN MIDDLE-AGED MALES BY A STEP TEST METHOD. J. sports Med. phys. Fitness, Dec. 1965, 5(4), 198-202. (Physical Education Lab., San Diego State College, San Diego, Calif.).

An on-going program primarily designed to develop cardiovascular fitness in occupationally sedentary, predominantly endomesomorphic, middle-aged males was described. 28 or about half of the Ss were given a maximal oxygen uptake test by a step test procedure. The results were compared with findings of other investigators. While there appeared to be some agreement with findings on similar groups using bicycle or treadmill, the authors point up the need for studies comparing methods.

R 24

26,497

deVries, H.A. & Klafs, C.E. PREDICTION OF MAXIMAL OXYGEN INTAKE FROM SUBMAXIMAL TESTS. J. sports Med. phys. Fitness, Dec. 1965, 5(4), 207-214. (Physiology of Exercise Research Lab., Long Beach State College, Long Beach, Calif.).

The purpose of this study was to evaluate 6 submaximal work capacity tests for prediction of maximum work capacity (aerobic capacity) in 16 male Ss between the ages of 20-26. The criterion measure was maximal O<sub>2</sub> intake measured on a bicycle ergometer. The submaximal test tests and their r's with the criterion measure were: a) Sjöstrand-Wahlund  $r=.877$ ; b) Sjöstrand-Wahlund modification using bench stepping,  $r=.438$ ; c) Harvard step test,  $r=.766$ ; d) Progressive pulse ratio test,  $r=.711$ ; e) 3 minute modification of Delta R. Q. prediction,  $r=.499$ ; and f) Astrand-Rhyming nomogram,  $r=.736$ . All r's were significant at  $P<.01$  except the modified Delta R. Q. where  $P<.05$  and the Sjöstrand modification which was not significant. In addition, 55 other college age Ss were tested and re-tested within the same day on the Sjöstrand-Wahlund test to establish reliability. The obtained  $r$  was .818. The standard errors of prediction of maximal O<sub>2</sub> from the 4 better submaximal test were: a) Astrand-Rhyming nomogram  $\pm 9.3\%$ ; b) Sjöstrand-Wahlund  $\pm 9.4\%$ ; c) Harvard step  $\pm 12.5\%$ ; and d) the progressive pulse ratio  $\pm 13.7\%$ .

R 13

26,498

Ricci, B., Bogan, P., Hadley, A., Shanafelt, R., et al. COMPARISON OF RECOVERY PRACTICES FOLLOWING TREADMILL RUNNING EXERCISE. J. sports Med. phys. Fitness, Sept. 1965, 5(3), 132-135. (Applied Psychology Lab., University of Massachusetts, Amherst, Mass.).

Walk recovery and stand recovery, 2 methods traditionally employed at the termination of running events, were studied in 4 male, athletic type, young Ss. Work was performed on a motor driven treadmill (10 Km./h., grade +10%). Recovery parameters were monitored for 10 min. Parameters included: blood pressure, hematocrit, rectal temperature, cardiac frequency, volume of expired air, and percent of carbon dioxide in expired air. At the cessation of the 10 min. recovery period, neither recovery method was found to be more beneficial than the other in the light of the parameters studied. Elimination of carbon dioxide was greater in stand recovery, especially during the first 4 min. as the Ss were inclined to hyperventilate. This greater elimination rate persisted until the 8th min. of recovery. 9th & 10th min. values were similar.

R 9

26,499

deVries, H.A. & Klafs, C.E. ERGOGENIC EFFECTS OF BREATHING ARTIFICIALLY IONIZED AIR. J. sports Med. phys. Fitness, March 1965, 5(1), 7-12. (Long Beach State College, Long Beach, Calif.).

It was hypothesized that breathing negatively ionized air would result in improved physical performance. To test this hypothesis, 45 college-age Ss (21 male, 24 female) were tested for endurance in bench stepping onto a 20-in. bench at 36 steps per min. Each S was tested 4 times; once following each of the 4 experimental conditions: a) negative ionization; b) positive ionization; c) placebo machine; and d) control--no machine. None of the mean differences in endurance time achieved significance at the .05 level of confidence, although the differences for women were in the direction predicted by the hypothesis.

R 15

26,500

Chrastek, J., Stolz, I. & Samek, L. ON DETERMINATION OF PHYSICAL FITNESS BY THE STEP UP TEST. J. sports Med. phys. Fitness, June 1965, 5(2), 61-66. (Institute of Sports Medicine, Charles University Prague, Prague, Czechoslovakia).

The results from examinations of 156 untrained and 396 trained persons were brought in relation with the results of others. When comparing whole groups we did not find significant differences between the abbreviated computation (Johnson), the classical (Brouha and col.) and the prolonged one (Schneider-Karpovich). Untrained persons have the fitness index above average given in the literature--over 80 points. Trained persons--in our case volleyball and basketball players--have the fitness index high above the limits given in the literature: men of the 1st league in the average over 120 points, women over 110 points. Sportsmen with an index over 180 points are however not exceptional.

R 23

26,502

McGill, W.J. & Gibbon, J. THE GENERAL-GAMMA DISTRIBUTION AND REACTION TIMES. J. math. Psychol., Feb. 1965, 2(1), 1-18. (Columbia University, New York, N.Y.).

The general-gamma distribution describes input-output times in a multistage process consisting of exponential components whose constants are all different. The distribution and its unique history are examined. A stochastic process that leads to it is presented. The conditional density (hazard) function is studied as a means for estimating parameters. Finally, the multistage process model is applied to simple reaction times in an effort to reveal underlying detection and response components.

R 34

26,503

Falmagne, J.C. STOCHASTIC MODELS FOR CHOICE REACTION TIME WITH APPLICATIONS TO EXPERIMENTAL RESULTS. J. math. Psychol., Feb. 1965, 2(1), 77-124. (University of Brussels, Brussels, Belgium).

Choice reaction times are analyzed on the basis of a simple model in which RT's are drawn at random from 1 of 2 ideal distributions. The 2 distributions correspond to different states of preparation. Loosely speaking, the S learns to expect certain stimuli and not others. Accordingly he draws his response from 1 or the other of 2 ideal distributions depending on whether or not he is prepared for the stimulus that is presented. The probability of this choice is determined by the sequence of stimuli prior to the response. The proposed model specifies a statistical learning process connecting the preparatory states to stimuli, and a sampling scheme that generates the RT distributions from the preparatory states. The model attempts to account for the relation between RT and stimulus probability, as well as for a variety of sequential effects found in reaction times. An experiment on choice RT is described. The model is applied in detail, parameters are estimated, and the outcome is subjected to critical scrutiny.

R 19

26,504

Suydam, Mary M. EFFECTS OF COST AND GAIN RATIOS, AND PROBABILITY OF OUTCOME ON RATINGS OF ALTERNATIVE CHOICES. J. math. Psychol., Feb. 1965, 2(1), 171-179. (University of Massachusetts, Amherst, Mass.).

On each of 45 trials, Ss were required to choose between 2 events and to rate the strength of their choice along a 9-point rating scale. The events on each trial represented a different combination of gain ratio, cost ratio, and probability of occurrence. The experimental design provided for the control of effects due to repeated presentation of options, and no exchange of chips or money took place. An ANOVA of the rating scale data showed all main and interaction effects to be significant ( $p < 0.001$ ). 2 decision models are discussed in relation to their predictive power for the present data. A model based on the concept of regret accurately described not only the rank ordering of the mean ratings but also the pattern of all main and interaction effects.

R 13

26,505

Wickelgren, W.A. & Becker, G.M. DECISIONS BASED ON CONFLICTING AND INACCURATE OBSERVATIONS. J. math. Psychol., Feb. 1965, 2(1), 180-189. (University of California, Berkeley, Calif. & Boston University, Boston, Mass.).

Ss learned the accuracies of 8 cues in a series of 50 learning trials and then used pairs of these cues to predict which of 2 equally likely symbols occurred in each of 100 test trials. It was concluded that: a) estimates of cues with very high or very low accuracies are better than estimates of cues with intermediate accuracies; b) accurate cues are perceived more realistically than are inaccurate cues; c) people tend to maximize expected payoff when faced with conflicting information in binary choice problems; d) conformity pressures, i.e., the desire to agree with 2 reports, strongly interfere with maximization if there is uncertainty about the maximizing response, but conformity pressures exert little influence when there is no uncertainty about the maximizing response.

R 4

26,506

Treisman, M. SIGNAL DETECTION THEORY AND CROZIER'S LAW: DERIVATION OF A NEW SENSORY SCALING PROCEDURE. J. math. Psychol., July 1965, 2(2), 205-218. (Institute of Experimental Psychology, University of Oxford, Oxford, England).

The relation between sensory thresholds and the "sensory scale" is examined in the light of the threshold model given by signal detection theory. The problem is seen as that of determining the function relating E, the central effect of a stimulus serving as the decision axis when threshold judgments are made, and I, the physical intensity of the stimulus. Consideration of the model shows that when deviations from Weber's law occur they may be accompanied by departures from Crozier's law and that the occurrence and extent of the latter depend on the relation between E and I and can be used to define it. The argument is applied to some of the data on visual brightness discrimination in the literature. The results suggest that E may be related to I by a power function with an exponent of the order of 1.0. The disparity between this function and the psychophysical laws given by classical scaling procedures is discussed, and it is suggested that it may prove useful to hypothesize a distinction between central discriminative and metric processes.

R 39

26,507

Shipley, Elizabeth F. DETECTION AND RECOGNITION: EXPERIMENTS AND CHOICE MODELS. J. math. Psychol., July 1965, 2(2), 277-311. (University of Pennsylvania, Philadelphia, Penn.).

An experiment is described in which each of 30s participated in 12 different detection and recognition tasks; relevant choice models based on Luce's work are examined. The stimulus parameter from a 2-alternative forced-choice task is shown to be related to the stimulus parameter from the corresponding yes-no detection task by a distance representation. An assumption is made to relate stimulus parameters from recognition tasks to stimulus parameters from detection tasks; again a distance representation is used and the predicted relation is supported by the data. Several extensions of the choice models to composite tasks that require both recognition and detection are examined. Multistage choice models in which recognition occurs first and is followed by detection are judged most adequate. Data from tasks with uncertainty in 1 of 2 aspects of the stimulus are compared with data from composite tasks to evaluate the assumption that covert responses actually occur in the former tasks and influence the overt responses. With 1 exception, response proportions summed over the irrelevant response from the composite tasks are similar to response proportions from the tasks with uncertainty. The exception, recognition when no signal is presented on 1/2 the trials, yields response proportions similar to those found in the simple recognition task. In general, the covert response assumption appears to be supported whenever both stages of choice are required.

R 11

26,508

Edwards, W.D. OPTIMAL STRATEGIES FOR SEEKING INFORMATION: MODELS FOR STATISTICS, CHOICE REACTION TIMES, AND HUMAN INFORMATION PROCESSING. J. math. Psychol., July 1965, 2(2), 312-329. (University of Michigan, Ann Arbor, Mich.).

Models for optional stopping in statistics are also normative models for tasks in which Ss may purchase risk-reducing information before making a decision. A Bayesian model for optional stopping for the 2-hypothesis continuous case is developed; it takes explicit account of cost of information, values of the possible outcomes of the final decision, and prior probabilities of the hypotheses. A nonparametric model for choice reaction times is derived. It makes strong predictions about times and errors; only one quantity in it is not directly observable. A second example uses the model to design and predict results of a binomial information-purchase experiment.

R 8

26,509

Lovejoy, E. AN ATTENTION THEORY OF DISCRIMINATION LEARNING. J. math. Psychol., July 1965, 2(2), 342-362. (University of Pennsylvania, Philadelphia, Penn.).

Consideration of the data on the Overlearning Reversal Effect (ORE) suggests that attention is an important variable in discrimination learning. A linear model is proposed for such learning in which 1 of 3 responses occurs: a) the S attends and makes a correct choice; b) the S attends and makes an error; or c) the S does not attend (and is successful with probability 1/2). A 3-vector of response probabilities is introduced and linear transformations of this vector are proposed corresponding to the 4 possible experimental events. The expected mean learning and extinction curves are found, and the expected number of total errors, in learning is computed. For appropriate parameter values, an ORE is predicted in terms of probability of correct.

R 20

26,510

Myers, J.L., Suydam, Mary M. & Gambino, B. CONTINGENT GAINS AND LOSSES IN A RISK-TAKING SITUATION. *J. math. Psychol.*, July 1965, 2(2), 363-370. (University of Massachusetts, Amherst, Mass.).

On each of 300 trials, Ss were required to choose between a known payoff and a risky option. The value of the known payoff was +1 on half of the trials, -1 on the other half. There were 2 between group variables, the level of risk and the probability that risk taking would result in a gain. This probability was contingent upon the value of the known payoff. At all 3 contingent probabilities, when the known payoff was +1, more risks were taken at the high than at the low risk level. When the known payoff was -1, less risks were taken at the high than at the low risk level. The results were considered in terms of 2 models for choice behavior.

R 9

26,511

Burke, D. & Gibbs, C.B. A COMPARISON OF FREE-MOVING AND PRESSURE LEVERS IN A POSITIONAL CONTROL SYSTEM. *Ergonomics*, Jan. 1965, 8(1), 23-29. (Defence Research Medical Labs., Toronto, Ontario, Canada).

In previous studies pressure lever control was greatly superior to that obtained with a free-moving lever in a task of compensatory tracking using velocity control. It seemed probable, however, that the margin of superiority would be reduced in tasks of lesser difficulty. In the present study the 2 types of control levers were compared in the relatively simple task of pursuit tracking in 1 plane only, using a positional system with zero lag. Target motion, which was simpler than that used in previous studies, consisted of discrete changes in uniform target velocity at various intervals. The 2 different types of control levers were mounted on a horizontal pivot to allow lateral movement from a central vertical position. Spring loading centralized the pressure lever and cursor when no lateral force was applied. Provision was made to vary the spring loading, so that forces of 0.5, 1, 2, 3, & 4 lb applied to the centre of the handgrip would displace the cursor by 5 cm giving 'gains' (displacement/force ratios) of 10, 5, 2.5, 1.67 & 1.25 cm/lb respectively. With both the pressure and free-moving levers the displacement of the cursor was proportional to the applied force or displacement of the lever, respectively, and the tracking cursor was centered on the display when the lever was central. Pressure control was superior to the free-moving lever at the  $p < 0.01$  level of confidence. Data are provided on the Ss' delays in responding to a step change of uniform velocity.

R 4

26,512

Dean, G.A. AN ANALYSIS OF THE ENERGY EXPENDITURE IN LEVEL AND GRADE WALKING. *Ergonomics*, Jan. 1965, 8(1), 31-47. (Commonwealth Scientific & Industrial Research Organization, Adelaide, South Australia).

Each of the component energy expenditures due to changes of kinetic and potential energy during walking is estimated and compared with the observed energy expenditure of walking. The principle findings of this paper are as follows: a) in ordinary walking the step frequency, by which each component energy expenditure is related to walking velocity, varies generally as the square root of the velocity and may be predicted; b) the maximum foot velocity in level walking is 3.2 times the walking velocity in agreement with the predicted value of  $\pi$ ; c) ankle flexion is more important than foot or leg length in determining the vertical movement of the trunk; d) the major component energy expenditures of level walking are those due to leg swinging, progression oscillation of the body, and vertical motion. In grade walking uphill on all except the smallest grades the main component is that due to vertical rise; e) the resultant total energy expenditure of level walking is represented by a small difference between relatively large components, indicating that considerable interaction occurs between positive and negative components, and hence is critically dependent on both the components and their interaction. Owing to the inevitable differences which exist between individuals the prediction of at least some of these quantities is insufficiently accurate to allow the useful calculation of the total expenditure.

R 32

26,513

Margaria, R., Mangili, F., Cuttica, F. & Cerretelli, P. THE KINETICS OF THE OXYGEN CONSUMPTION AT THE ONSET OF MUSCULAR EXERCISE IN MAN. *Ergonomics*, Jan. 1965, 8(1), 49-54. (Istituto di Fisiologia Umana, Università di Milano, Milano, Italy).

4 normal Ss performed exercises of different intensities running on a treadmill. In different experiments the Ss ran at 12 km/hr., at inclines of +5%, +8%, & +15% and at 15 km/hr. at inclines of +13% & +18%. The oxygen uptake was measured: a) before the work, with the S in the standing position; and b) at definite intervals during the work. The  $O_2$  uptake process at the beginning of exercise in man can be described as a process of an exponential type related to the intensity of the exercise. Its speed constant has the same value both for work performed in aerobic conditions as for very strenuous exercise involving an energy expenditure higher than can be maintained on the  $O_2$  consumption (Anaerobic conditions). The half reaction time of this process is about 30 sec. These results support the hypothesis that the intracellular oxidation processes are coupled with the splitting and resynthesis of the high energy phosphate processes in muscle. The speed of oxidative processes in muscle does not seem to be a limiting factor to the oxygen uptake in muscular exercise. The maximum  $O_2$  consumption level is presumably set by the capacity of the  $O_2$  transport from the lungs to the active tissues.

R 12

26,514

Malhotra, M.S. & Gupta, J.S. CARRYING SCHOOL BAGS BY CHILDREN. *Ergonomics*, Jan. 1965, 8(1), 55-60. (Defence Institute of Physiology & Allied Sciences, Madras, India).

Studies have been conducted to determine the most economical way of carrying school bags by children. 6 schoolboys between 9 & 15 years of age were used as Ss. They were made to march at 2.5 mph carrying school bags weighing 6 lb in 4 different positions: a) rucksack; b) low back; c) across the shoulder; d) in the hand. Minute ventilation, oxygen consumption and pulse rate were recorded during the steady state of marching. The rise in these measures was found to be minimal when the bag was carried in rucksack fashion, and maximum values were found when it was carried in the hand; the low back and side positions being intermediate. In the rucksack and lowback method both hands are free. An additional advantage of the rucksack method is that there is free movement of all parts of the body. The hand carriage is the most inefficient method, the energy expenditure being 241 as compared to 100 of the rucksack method. There is marked bending of the body and deformity in posture.

26,515

Langdon, F.J. THE DESIGN OF CARD PUNCHES AND THE SEATING OF OPERATORS. *Ergonomics*, Jan. 1965, 8(1), 61-68. (Department of Scientific & Industrial Research, Garston, Herts, England).

The measurements of 142 female punch operators and the dimensions of their chairs and punch machines were studied. A number of possible relationships were investigated in an attempt to find out what factors are responsible for determining the height at which the seat is set: a) Height of operator. Coefficients of correlation between seat height and operators' height were calculated. None were significantly non-zero; b) Type of shoe. Shoes were classed as either low, medium or high heeled. No relation was found between height of seat and type of shoe worn; c) Height of backrest. Correlations were found in 3 out of 7 offices studied; d) Height of elbow. A correlation of .41 was found between height of elbow and height of keyboard; e) Height of keyboard was highly correlated with seat height, the coefficient being .45. It was shown that the factor controlling the height of the seat, and in consequence the posture of the operator, is the height of the keyboard. The design of the equipment is discussed and suggestions made for improving its design. Reference is made to other studies bearing on the same problem.

R 7

26,516

Poulton, E.C. ON INCREASING THE SENSITIVITY OF MEASURES OF PERFORMANCE. *Ergonomics*, Jan. 1965, 8(1), 69-76. (Applied Psychology Research Unit, MRC, Cambridge, England).

This paper illustrates some of the methods which have been used to increase the sensitivity of measures of performance: a) adjusting the difficulty of the task--the most sensitive test is one using a task on which the average performance of the combined control and experimental groups is about 50%; b) saturating the man's channel capacity by giving him an additional task to perform--the additional task should engage different receptors and effectors and should not be of a kind which is known to produce direct associative interference with the primary task; c) using an unfamiliar task; d) measuring variability instead of mean performance; e) selecting specific events on which to make measurements--if it is possible to specify in advance the exact times at which an effect should occur, performance can be examined at these particular times, instead of averaging over a longer period of time. In this way the effect can be measured in a relatively pure form, uncontaminated by the random or systematic variability which may characterize the longer period; f) examining component rather than overall measures; and g) channelling 2 dimensions of variability into one. Finally, it raises a methodological difficulty in comparing the results of performance tests which may differ in sensitivity.

R 34

26,517

Conrad, R. & Longman, D.J.A. STANDARD TYPEWRITER VERSUS CHORD KEYBOARD--AN EXPERIMENTAL COMPARISON. *Ergonomics*, Jan. 1965, 8(1), 77-88. (Applied Psychology Research Unit, MRC, Cambridge, England & Post Office, England).

A brief history of the development of the typewriter is given. An alpha-numeric data input keyboard is described which, by utilizing chords of 2 keys per character, minimizes the reach movements which are an intrinsic feature of typewriting. Chord keyboards require a statement of the time tolerance within which all keys of the chord must be struck. In the present equipment 50 msec was used. 2 errors, not possible on a typewriter, can occur; the 50 msec tolerance may not be met, or more than 2 keys may be struck. An experiment was carried out in which 2 groups of postmen were trained for 7 weeks, 1 group on the chord keyboard, the other on a standard typewriter. The typewriter group were able immediately on completion of a trial to examine their copy for errors. This group, therefore, knew at once how many, and which errors they were making. The chord group had no such immediate error feedback. The results showed that the chord group became "operational" about 2 weeks sooner than the typists. Beyond that point, improvement rates could be reasonably regarded as parallel, with the typists a little slower than the chord group with little difference in accuracy, other than that attributable to the special experimental conditions.

R 13

26,518

Ahlmark, Gosta & Murrell, K.F.H. LABORATORY STUDIES OF REPETITIVE WORK. III. SKILLS INVOLVED IN READING METERS. *Ergonomics*, Jan. 1965, 8(1), 89-92. (Welsh College of Advanced Technology, Cardiff, Wales).

The idea that operatives engaged on repetitive tasks involving classifying components by reading a meter can learn to make decisions from the needle movement has been investigated. The apparatus consisted of 6 holes into which 6 screws were placed; key A which, when pressed caused a meter to be energized in accordance with a random program; and other keys which classified the response and discharged the 6 screws. It was assumed that a S would hold down key A only so long as she needed to observe the movement of the needle in order to decide in which of the 5 spaces it was going to stop. The time of operation of this key was recorded. 2 Ss were used. Errors of classification were less than 0.1%. About 80-100 readings were taken on 9 days 60 min after work had commenced. Results obtained confirm the hypothesis investigated and the following suggestions are offered: a) if this "skill" can be acquired unconsciously it can equally well be taught now that it has been identified; b) the existence of this "skill" must be taken into account when setting time standards; c) the acquisition of the "skill" may be facilitated by designing the meter so that the terminal positions (and hence the needle speeds) are widely separated.

R 2

26,519

Spencer, J. EXPERIMENTS ON ENGINEERING DRAWING COMPREHENSION. *Ergonomics*, Jan. 1965, 8(1), 93-110. (Psychology Dept., Bristol University, Bristol, England).

A method is described which allows an investigation of the difficulties experienced by people when they attempt to understand engineering drawings. The method requires Ss to make comparisons between drawings of simple objects and solid models of the same objects. In 1 variant of the method, Ss have to recognize a model which matches the drawing given to them; in the other variant they have to assemble a model to match the drawing. Undimensioned and dimensioned drawings were prepared for each of 4 projection types: a) First Angle Orthographic; b) Third Angle Orthographic; c) Isometric; and d) True Perspective. The full series of 8 drawings was presented to samples of draughtsmen and university Arts students of both sexes who were totally unfamiliar with engineering drawings. Results show the clear superiority of both representational projections for the tasks used as judged by criteria of speed and accuracy. The success of orthographic drawings was determined for the draughtsmen chiefly by their training and current experience. Thus, there was little to choose between First or Third Angle Orthographic drawing lay-out. The implications of the findings are discussed.

26,520

Dittrich, F. & Fumeaux, J. A GENERALIZED EXPRESSION OF AUDITORY SENSITIVITY. *Ergonomics*, April 1965, 8(2), 143-149. (Physical Lab. & Otological Clinic, University of Geneva, Geneva, Switzerland).

A statistical study with 400 Ss, male and female, equally divided, in 7 age groups (I: 15-19 years; II: 20-29 years, etc.) has confirmed the classical data given by Bunch (1929, 1931), Leisti (1942), Sataloff (1953) and others on presbycusis or auricular senescence. Hearing loss in decibels (db) observed by age and by frequency, calculated statistically, corresponds to the values determined by them. At the same time a mathematical relation has been established expressing in a general manner the variations of auditory sensitivity.

R 6

26,521

Winsemius, W. SOME ERGONOMIC ASPECTS OF SAFETY. *Ergonomics*, April 1965, 8(2), 151-162. (Mental Health Dept., Netherlands Institute for Preventive Medicine, Leiden, Holland).

A case-study of a certain type of punching machine in a stationery factory revealed that typical accidents were caused by the neglect of certain ergonomic principles in the construction of the machine. There was 1 specific type of disturbance in the work-process to which workers reacted with a rash movement intended to eliminate the disturbance. The risk of accidents seems to be connected exclusively with this movement, which is nevertheless the one preferred to an alternative way of eliminating the disturbance, because this safe way involves more complicated movements and a more radical interruption of the immediate task.

R 2

26,522

Poulton, E.C., Hitchings, N.B. & Brooke, R.B. EFFECT OF COLD AND RAIN UPON THE VIGILANCE OF LOOKOUTS. *Ergonomics*, April 1965, 8(2), 163-168. (Applied Psychology Research Unit, MRC, Cambridge, England).

16 men performed lookout duties twice at sea in winter on an open bridge, once in the Arctic (mean temperature 28°F) and once in a more temperate climate (mean 37°F) in counter-balanced order. The 2 signal sources were separated by an angle of 75° and presented 7 signals each in an irregular order and at irregular intervals during a 30-min. watch. The lookout had to respond as soon as he saw a signal. There were reliably more response times of 2.0 sec. or longer in rain than in the cold ( $p < .01$ ). There was a reliable increase in the number of long response times during the watches in the cold ( $p < .01$ ) accompanied by a mean fall in oral temperature of 1.2°F.

R 9

26,523

Tickner, A.H. INTERMITTENT DISPLAY PRESENTATION IN COINCIDENCE JUDGMENTS. *Ergonomics*, April 1965, 8(2), 169-172. (Applied Psychology Research Unit, MRC, Cambridge, England).

An account is given of an experiment to investigate the effect of the intermittent presentation inherent in a filmed display used for a coincidence judgment. 3 conditions were investigated: a) a display drawn on paper; b) a film of (a); and c) the display used in (a) viewed through a rotating shutter. No significant difference was found between the 3 conditions.

R 3

26,524

Rey, P. & Rey, J.P. EFFECT OF AN INTERMITTENT LIGHT STIMULATION ON THE CRITICAL FUSION FREQUENCY. *Ergonomics*, April 1965, 8(2), 173-180. (Institut de Physiologie, Université de Genève, Geneva, Switzerland).

The effect of intermittent light stimulation (ILS) on the critical fusion frequency (cff) has been studied. Some stimulation frequencies (effective frequencies) induced a drop in the cff. These frequencies are lower than the initial cff and higher than 2 cps. The maximum drop was obtained for a frequency equal to about half of the cff of the subject. The relation between the drop of the cff and the frequency of stimulation can be expressed as a U-shaped curve. It can be mathematically formulated for each S with 3 constants which varied remarkably little from S to S. The time course of the drop for a given frequency as well as the kinetics of recovery were exponential. The time constant was independent of the frequency of the ILS. If the stimulus consisted in printed letters read by the S, a drop of the cff followed by a recovery was observed, both with an exponential time course. The influence of these effects on the techniques used to measure the cff has been discussed. The value of a cff decrease as a criterion of mental fatigue has been questioned.

R 5

26,525

Shaffer, L.H. PROBLEM SOLVING ON A STOCHASTIC PROCESS. *Ergonomics*, April 1965, 8(2), 181-192. (Applied Psychology Research Unit, MRC, Cambridge, England).

This study is concerned with man-computer cooperation in which the computer initiates decisions and the man monitors and can alter these. The task used involved controlling an information process by making decisions at each of a sequence of points. The problem of control was to find an optimal procedure that jointly minimized 2 variables. The solutions of Ss developed over a series of trials were compared with that of an optimal programme under different conditions. S performance was nearly always inferior to that of the programme, it was impaired by increasing the rate of the information input and failed to benefit from reduction of uncertainty in the input. Giving trial knowledge of results helped convergence towards an optimal solution. Ss who had gained experience in the task were given computer solutions to monitor. They degraded optimal solutions and improved inferior solutions towards their own level of performance and failed to benefit from this experience in subsequent tests.

R 3



26,526

Dennis, J.P. THE EFFECT OF WHOLE-BODY VIBRATION ON A VISUAL PERFORMANCE TASK. Ergonomics, April 1965, 8(2), 193-205. (Liberal Studies Dept., College of Technology, Portsmouth, England).

The effect of whole-body vibration upon a task requiring the reading of printed numbers has been investigated at 2 levels of peak-to-peak acceleration of 1/2g and 1g over a frequency range of 5 to 37 cps. Head movement in the vertical plane was measured during performance of the visual task. Movement of the head showed progressive attenuation as frequency of vibration was increased, the transmission factor being approximately 100% at 5 cps and 10% at 37 cps. Changes in frequency of vibration had considerable effects on visual performance; e.g., similar amounts of deterioration in visual performance being produced at head movements of 0.200 in. and 0.0006 in. at 5 and 37 cps respectively. These results support previous theories of resonance of eyeball and/or facial tissue to account for the impairment of vision found with very small head movements in the upper frequencies. Changes in amplitude of head movement appeared to have more effect at the lower and middle frequencies (7-19 cps) than at 27 cps. This also was in accordance with previous theory.

R 17

26,527

Agan, T., Anderson, E., Reis, I.L. & Carson, A.M. A METHOD OF MEASURING POSTURAL ATTITUDES. Ergonomics, April 1965, 8(2), 207-221. (Agricultural Experimental Station, Kansas State University, Manhattan, Kan.).

A technique to measure in 3 dimensions (horizontal plane Z, vertical plane Y, and longitudinal plane X) simultaneously the postural attitudes of Ss at work is described. A large mirror hung at a 45° angle over Ss at work, a camera pre-positioned in relation to the centre of the work, a projector positioned to a grid in relation to camera work, and correction factors to compensate for parallax constituted the technique. The technique was applied to the measurement of postural attitudes of aged women cleaning the floor and wall around and behind a toilet stool with the normal side obstructions of a tub and wall positioned 20 in., 15 in., 13 in. & 11 in. from the centre. The most extreme posture, occurring when the Ss were kneeling with the working left arm and palm extended forward with little or no elbow bend, is discussed. ANOVA showed the most important variation was between the 20 in. and the 15 in. allowance. Variations occurred more for the Z & Y planes than for the X plane. Parts of the body affected significantly by confinement of space were the head, the cervical, the acromions, the elbows and the knees. Rate of work decreased perceptibly as confinement of space increased, especially in areas where postural attitudes were difficult. The technique has implications for assaying the correlation of postural attitudes and physiological responses.

R 9

26,528

Woodcock, A.H. & Breckenridge, J.R. A MODEL DESCRIPTION OF THERMAL EXCHANGE FOR THE NUDE MAN IN HOT ENVIRONMENTS. Ergonomics, April 1965, 8(2), 223-235. (USA Research Institute of Environmental Medicine, Quartermaster Research & Engineering Command, Natick, Mass.).

A theoretical model based on the physical laws of heat and moisture exchange is developed to describe the energy exchange between nude man and a hot environment. Equations are presented which express the heat loss from a heated moistened "skin" in terms of ambient temperature, humidity and wind. 2 different situations are considered; the 1st where secreted sweat is all evaporated and cooling depends on the amount secreted; and the 2nd, where the skin is wet and cooling limited by the amount of sweat which can be evaporated. In the 1st case, heat dissipation depends on air temperature and amount of sweat secretion, which varies among individuals. In the 2nd, wet-bulb temperature is shown to be a determining factor, as has already been observed in studying man's tolerance to heat. Graphical presentation is used to demonstrate the individual and combined effects of various environmental factors and to interpret the experimental results of other investigators.

R 21

26,529

Adamson, G.T. & Finlay, S.E. THE EFFECTS OF TWO PSYCHOSTIMULANT DRUGS ON MUSCULAR PERFORMANCE IN MALE ATHLETES. Ergonomics, April 1965, 8(2), 237-241. (Physical Education Dept., Leeds University, Leeds, Yorkshire, England & Student Health Dept., Leeds University, Leeds, Yorkshire, England).

An account is given of an investigation into the effect of 2 psycho-stimulant drugs on static muscular strength and local muscular endurance of athletes. 12 Ss ranging from 19 to 37 years participated in a double blind trial. The drugs produced a significantly better performance in the dynamometrical strength tests, but not in muscular endurance. There was no placebo effect. The trial suggests an objective method of testing the efficacy of short psycho-stimulant drugs.

R 3

26,530

Leonard, J.A. & Newman, R.C. ON THE ACQUISITION AND MAINTENANCE OF HIGH SPEED AND HIGH ACCURACY IN A KEYBOARD TASK. Ergonomics, July 1965, 8(3), 281-304. (Applied Psychology Research Unit, MRC, Cambridge, England).

The performance of groups of Ss was studied in a controlled laboratory training situation. The variables reported on are displays, keyboards, instructions, and age. It was found that under all the display conditions investigated Ss were able to achieve and maintain high speed and high accuracy without immediate augmented feedback; that final performance requiring high accuracy was unaffected by instructions stressing speed during initial training; that there was no difference between a single finger and a 5-finger keyboard; and that while older Ss were significantly slower than younger all Ss were able to perform a copying task quite adequately. The role of augmented feedback during training, and the ability of Ss to detect their own errors, are discussed.

R 19

26,531

Moore, B.M. AGE AND ERROR IN A ROTE LEARNING TASK. *Ergonomics*, July 1965, 8(3), 305-314. (National Foundation for Educational Research).

An experiment in spaced learning of paired associates by an "activity" method is described in which the amount of specific hand/arm movement adjunctive to the task was varied during learning and in which both the amount and type of movement were varied during testing. Compared with 14 1/2-15 1/2 years old school leavers the performance of 40-50 year old trainee G.P.O. letter sorters was significantly poorer in all groups. It was especially poor in the older group in which the conflict between the information to and from visual and positional sources was maximal. An analysis of errors indicated that the difficulties of the older groups were for the most part related to errors which, although central as distinct from peripheral in origin, nevertheless appeared to persist in an involuntary way. Implications for training and programmed instruction are discussed briefly.

R 11

26,532

Macrae, A.W. & Holding, D.H. METHOD AND TASK IN MOTOR GUIDANCE. *Ergonomics*, July 1965, 8(3), 315-320. (Psychology Dept., University of Leeds, Leeds, Yorkshire, England).

Restriction and forced-response guidance were used as training methods for 2 forms of a manual positioning task. The most effective training was given in each case by the guidance technique which most resembled the form of the task to be learned. As in a previous experiment, restriction appeared more effective in a "push" task. In a modified "release" task, forced-response appeared the better method. In addition, 2 groups were given experience of alternative movements as an aid to learning the wanted movement. Although they thus practised fewer movements of the distance required in the final test neither method became less effective, with the forced-response technique showing some improvement.

R 7

26,533

Goldman, R.F. ENERGY EXPENDITURE OF SOLDIERS PERFORMING COMBAT TYPE ACTIVITIES. *Ergonomics*, July 1965, 8(3), 321-327. (USA Research Institute of Environmental Medicine, Quartermaster Research & Engineering Command, Natick, Mass.).

The energy cost of a number of tactical tasks was measured for soldiers during tactically controlled rather than experimentally controlled tasks. The upper range of energy expenditure rates was 400 to 450 kcal per hour during these tactical manoeuvres; incipient physical or heat exhaustion was associated with the few much higher values. The realism of the tactical situation, and an estimate of the contribution made by the heat load and wearing of the gas mask to the energy costs measured is presented. The hypothesis is presented that the upper range of energy expenditure rates for prolonged periods is independent of terrain when men are allowed to work at their own pace, but depends on the total weight carried. The relationship between ventilation volume and energy expenditure in this study is compared with data presented by Liddell and supports the argument that calculation of energy expenditure can be reliably made using a single formula to convert ventilation volume per se, particularly within the practical accuracy of field measurements.

R 17

26,534

Monod, H. & Scherrer, J. THE WORK CAPACITY OF A SYNERGIC MUSCULAR GROUP. *Ergonomics*, July 1965, 8(3), 329-338. (Laboratoire de Physiologie du Travail du C.N.R.S., Paris, France).

A new conception of dynamic or static muscular work tests is presented. The authors define the critical power of a muscular work from the notions of maximum work and maximum time of work. The work capacity is then considered in the case of dynamic work, and of continuous or intermittent static work. From the data presented it is possible to define the maximum amount of work that can be performed in a given time as well as the conditions of work performed without fatigue.

R 22

26,535

Zeff, C. COMPARISON OF CONVENTIONAL AND DIGITAL TIME DISPLAYS. *Ergonomics*, July 1965, 8(3), 339-345. (Loughborough College of Technology, Leicester, England).

An experiment was devised to compare the speed and accuracy of reading the time from possible forms of conventional rotary clocks and digital clocks for both 12-hour and 24-hour displays. 20 Ss were each presented with 96 displays of digital and conventional clocks in a balanced experimental design. The results showed that the speed of reading (for logging to the nearest min.) is 3 1/2 to 4 times faster with a digital than with a conventional clock. The errors with a conventional clock are 10 times those with a digital clock. No significant difference was found between the 0-12 hour and 13-24 hour displays for either the digital or the conventional clock.

R 5

26,536

Müller, E.A. PHYSIOLOGICAL METHODS OF INCREASING HUMAN PHYSICAL WORK CAPACITY. (ERGONOMICS RESEARCH SOCIETY'S LECTURE, 1965). *Ergonomics*, Oct. 1965, 8(4), 409-424. (Max-Planck-Institut für Arbeitsphysiologie, Dortmund, Germany).

This report presents much of the work which has been done in the laboratory of Müller on the conditions and limits of muscular work. The paper analyzes several interrelated physiological functions upon which human physical work capacities are based, in the context of the enhancement of work capacity. The following summarizes the conclusions of the report: To increase future work capacity, isometric and dynamic training is the best way. Physiological knowledge can be used to improve and rationalize the effect of training. Immediate increase of work capacity is possible by abbreviating recovery either during work (by preliminary interruption of blood supply) or after work (by massage). Both ways induce a latent exhaustion which becomes apparent later on. An immediate increase of work capacity without such after-effects is caused by cooling the skin through sweating before or during work. Most of these methods were discovered long since; it needed, however, physiological research to understand their mechanism and to use them in the optimal way.

R 18

26,537

Rolfe, J.M. AN APPRAISAL OF DIGITAL DISPLAYS WITH PARTICULAR REFERENCE TO ALTIMETER DESIGN. *Ergonomics*, Oct. 1965, 8(4), 425-434. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

The paper examines critically the experimental evidence currently available which relates to the display of height information using digital indicators. After reviewing data for both static and dynamic experiments the conclusion is drawn that there is a need for much more research into the information transmission characteristics of digital displays. The static experiments which have examined digital displays have produced results which would indicate that digital displays are extremely efficient means of displaying quantitative information providing this information does not normally involve spatial relationships with other information, in which case some ancillary analogue may be required to ensure the best display. However, whilst one digital display may be a great improvement on a display panel the addition of other similar displays can make check reading more difficult and make discrimination between displays much more demanding. The indications from dynamic experiments must be treated more cautiously. Recent experiments have indicated that under certain conditions tracking is possible using a wholly digital display and so also is rate appreciation. However the extent to which dynamic digital displays can be used may well be limited by the same factors as those derived from the static evaluations. A postscript on electronic digital displays is appended.

R 18

26,538

Rabbitt, P.M.A. & Rogers, M. AGE AND CHOICE BETWEEN RESPONSES IN A SELF-PACED REPETITIVE TASK. *Ergonomics*, Oct. 1965, 8(4), 435-444. (National Institutes of Health, Bethesda, Md.).

When young Ss select between 2 responses of similar amplitudes, and in the same direction, they can overlap identification of 1 of 2 signals with the initial movement of a reach appropriate to either. They thus respond more quickly when selecting between responses of similar amplitudes than when selecting between responses of very different amplitudes. Older Ss are less able to overlap movement and choice time and so benefit less from a choice between similar as against dissimilar responses. Young Ss respond faster when cycles of responses during the task are alternated than when they are repeated. This tendency appears to be related to guessing strategies earlier described as the "negative recency effect" or "gambler's fallacy". The latencies of young Ss' responses appear to be directly dependent on the latencies of immediately preceding responses rather than on the response rate for the sequence as a whole. Latencies of old Ss' responses are affected by both factors. Implications for the design of consoles are discussed.

R 17

26,539

Allan, J.R. THE EFFECTS OF PHYSICAL TRAINING IN A TEMPERATE AND HOT CLIMATE ON THE PHYSIOLOGICAL RESPONSES TO HEAT STRESS. *Ergonomics*, Oct. 1965, 8(4), 445-453. (Army Operational Research Establishment, West Byfleet, Surrey, England).

The effects of vigorous physical training in a hot climate were assessed and compared with those produced by identical physical training under cooler ambient conditions: 108 Ss were divided into 2 treatment groups. Each group was then given the same intensive physical training for 3 hours daily for 14 consecutive days. One group was trained in a hot climatic chamber, the other in a separate room of similar proportions but at ambient environmental temperature. To produce an early rise in temperature, the first two and one half hour exercise periods of each day were intensive. A target temperature of 38.3°C (101°F) was chosen, there being good published evidence that this would result in a satisfactory level of acclimatization. Subsequently the intensity of exercise was varied by the instructor according to the mean level of body temperature which was measured orally after the first and second hour of each period. The severity of the climate was gradually increased as acclimatization developed. Both types of training resulted in a lowering of physiological strain during a standardized heat exposure. The effect was greater for those trained in the hot climate. The results are discussed in relation to other artificial acclimation techniques.

R 12

26,540

Brown, I.D. A COMPARISON OF TWO SUBSIDIARY TASKS USED TO MEASURE FATIGUE IN CAR DRIVERS. *Ergonomics*, Oct. 1965, 8(4), 467-473. (Applied Psychology Research Unit, MRC, Cambridge, England).

Car driving has been studied by combining it with a subsidiary task, performance on which is negatively correlated with the perceptual load imposed by changing conditions of traffic. The present experiment compares a subsidiary task which required almost continuous attention to an auditory display, and which involved memory spans of only 3 sec, with an alternative task which did not require continuous attention, but which involved memory spans of up to 55 sec. The former was found to have some advantages. This comparison was combined with a study of men engaged in 8-hour spells of car driving. Some explanations are offered for the finding that performance on the subsidiary tasks was better at the end of the workspell than at the beginning.

R 6

26,541

Brown, I.D. EFFECT OF A CAR RADIO ON DRIVING IN TRAFFIC. *Ergonomics*, Oct. 1965, 8(4), 475-479. (Applied Psychology Research Unit, MRC, Cambridge, England).

8 drivers were tested in light and heavy traffic while listening to recorded programmes of music and speech. The effects of these auditory distractions on the use of the car controls and time taken over a standard test circuit of 2.2 miles were measured by comparison with scores obtained in a quiet condition of normal driving. In light traffic, music significantly reduced the frequency with which the accelerator and brake pedals were used ( $p=.05$ ), and in heavy traffic it increased the time taken per circuit ( $p=.05$ ). These changes were interpreted as being beneficial. Speech had an insignificant effect on all scores, whether listening was motivated simply by interest in the program, or by the need to remember its content.

R 18

26,542

Torle, G. TRACKING PERFORMANCE UNDER RANDOM ACCELERATION: EFFECTS OF CONTROL DYNAMICS. Ergonomics, Oct. 1965, 8(4), 481-486. (Saab Aircraft Company, Linköping, Sweden).

Trials were conducted in a moving simulator (one degree of freedom) in order to study the effect on manual tracking performance of backlash and friction in the control stick and on an arm-rest. Experiment I was intended to study the effect of various amounts of backlash-0°, 0.5°, and 1°- at 2 acceleration levels,  $\ddot{x}=0$  and 0.2. 4 Ss made 8 runs each (2 blocks of 4) at each backlash setting (configuration). Experiment II was concerned with friction and consisted of 2 consecutive series. 3 Ss were used. As in Experiment I, each S performed 2 blocks of 4 trials at each configuration. 3 different levels of the friction moment  $M_0$  were tested:  $M_0=91$ , (2,4,8)  $10^{-4}$  Nm, which corresponded to stick deflections of  $\pm 2^\circ$ ,  $4^\circ$ , and  $8^\circ$  with the spring used. Experiment III dealt with the arm-rest. 3 configurations were tested in an initial series: a) no arm-rest; b) a small arm-rest; c) a large arm-rest. 3 Ss were used. Tracking performance with and without the small arm-rest was compared in a second series with various degrees of gust acceleration,  $\ddot{x}=0$ , 0.15 and 0.30. The results show that backlash and friction should be avoided and that an arm-rest gives a significant reduction in tracking errors when the pilot is subjected to gust acceleration.

26,543

Macrae, A.W. & Holding, D.H. GUIDED PRACTICE IN DIRECT AND REVERSED SERIAL TRACKING. Ergonomics, Oct. 1965, 8(4), 487-492. (Psychology Dept., University of Leeds, Leeds, Yorkshire, England).

A discrete tracking task was arranged in which movements of a lever extinguished a series of stimulus lights, using either compatible or incompatible display-control relationships. Movement of the lever could be controlled by the S, or made automatic in order to provide guidance. 6 groups of Ss were given 9, 1, or 0 guided runs before beginning normal practice on either the direct or reversed form of the task. As expected, the reversed task was more difficult than the direct version. On both forms of the task guidance formed effective pre-training, although 9 trials of guidance were not 9 times as effective as 1 such trial. Guidance tended to have a greater effect upon the reversed form of task, as would be expected were its main function to prevent the commission of errors.

R 9

26,544

Wickelgren, W.A. ACOUSTIC SIMILARITY AND RETROACTIVE INTERFERENCE IN SHORT-TERM MEMORY. J. Verbal Learn. verbal Behav., Feb. 1965, 4(1), 53-61. (Massachusetts Institute of Technology, Cambridge, Mass.).

Short-term memory for a list of 4 letters, followed by a list of 8 letters that the Ss copied as they were presented, followed by immediate recall of the original 4-letter list, was shown to be a function of the acoustic similarity of the intervening list to the original list. An interfering list whose letters have similar pronunciation to the letters in the original list produces greater RI than an interfering list whose letters have a very different pronunciation from the letters in the original list. An interfering list composed of items identical to items in the original list, but in a different order, tends to produce less RI in the recall of items and more RI in the recall of the correct position of these items than an interfering list composed of similar items. These findings for STM are completely consistent with analogous studies of RI as a function of similarity in LTM.

R 18

26,545

Gough, P.B. GRAMMATICAL TRANSFORMATIONS AND SPEED OF UNDERSTANDING. J. verbal Learn. verbal Behav., April 1965, 4(2), 107-111. (Indiana University, Bloomington, Ind.).

This study tested an hypothesis that the hearer of a complex sentence must transform that sentence into the underlying kernel sentence before understanding it, and hence that speed of understanding a sentence would vary with the number and nature of the transformations separating it from its kernel. Descriptive sentences of varying grammatical form were presented to Ss who were asked to verify them, and the speed of verification was taken as an index of speed of understanding. Active sentences were found to be verified faster than passive, affirmative faster than negative, and true faster than false. The true-false variable was found to interact with the affirmative-negative, indicating that the latter difference is not simply syntactical. The consistency of the results with the hypothesis was noteworthy, but transformational complexity was confounded with frequency and length.

R 10

26,546

Clifton, C., Jr., Kurcz, Ida & Jenkins, J.J. GRAMMATICAL RELATIONS AS DETERMINANTS OF SENTENCE SIMILARITY. J. verbal Learn. verbal Behav., April 1965, 4(2), 112-117. (University of Minnesota, Minneapolis, Minn.).

Generalization of a motor response among the kernel, passive, negative, and passive-negative forms of a number of sentences was investigated. The generalization among such constructions, relative to generalization among unrelated sentences, was found to be highly significant. A distance metric was used to compare the generalization decrements obtained between the various constructions. It was found that the distance between sentences related by the passive transformation was less than the distance between sentences related by the negative transformation, or by the combination of the negative and passive transformations. The distance between sentences related by the negative transformation was not consistently less than the distance between sentences related by the combination of passive and negative transformations. However, when the possible orders of application of the transformation were taken into account, it appeared that the distance between sentences related by the combination of passive and negative transformations equalled the sum of the distance between sentences related by the passive transformation and the distance between sentences related by the negative transformation. The implications of current linguistic analyses calling into question the transformational nature of the relationships among the sentences were briefly considered.

R 7

26,547

Treisman, Anne M. VERBAL RESPONSES AND CONTEXTUAL CONSTRAINTS IN LANGUAGE. J. verbal Learn. verbal Behav., April 1965, 4(2), 118-128. (Psycholinguistics Research Unit, Institute of Experimental Psychology, MRC, Oxford, England).

Estimates of the probability and information content of words in a set of statistical approximations to English, 2 passages of normal prose and a passage of "syntactical English" were obtained from the guesses of 100 Ss at each of 20 missing words for each passage. The information in the missing word and the entropy in the distribution of guesses were shown to be linearly related to the degree of contextual constraint weighted for distance by the formula  $\frac{1}{n^2} (i-1)$ , where  $n$  is the order of approximation. The entropy in the distributions of parts of speech and the entropy of conceptual units ("synonym clusters") were also calculated. It was found that while the choice of grammatical category makes a relatively independent contribution to the change in redundancy with different passages, the change in entropy of "meaning" parallels the change in entropy of the particular words.

R 11

26,548

Tannenbaum, P.H., Williams, F. & Millier, Carolyn S. WORD PREDICTABILITY IN THE ENVIRONMENTS OF HESITATIONS. J. verbal Learn. verbal Behav., April 1965, 4(2), 134-140. (Mass Communications Research Center, University of Wisconsin, Madison, Wisc.).

2 experiments were conducted to study the predictability of words in hesitation contexts. The first study focused on a comparison of the first word after hesitations with words sampled from fluent contexts. The second study involved gathering predictability data for all words in a language sample. Results supported the hypothesis that words subsequent to hesitations tend to be less predictable than words uttered in fluent context. But the associated hypothesis that the word antecedent to hesitations is more predictable than other fluent context was not supported. This led to further analysis of predictability of words in the environments of different hesitations, specifically filled pauses and repeats. The implication drawn was that different types of hesitations index different kinds of encoding decision points.

R 19

26,549

Lamb, S.M. THE NATURE OF THE MACHINE TRANSLATION PROBLEM. J. verbal Learn. verbal Behav., June 1965, 4(3), 196-210. (University of California, Berkeley, Calif.).

Machine translation can be viewed as a type of human translation, since the translating machine will merely follow rules provided by the human linguists now engaged in machine translation research; but it is more difficult than ordinary human translation, and the solution of the problem requires a careful analysis of the translation process and its relation to linguistic structure. The inadequacy of ineffective procedures can be shown by their lack of means of handling various phenomena known to exist in languages. Methods that can be discarded in this way include those of word-for-word substitution and word-for-word substitution plus doctoring, as well as other methods which use words as basic units. More advanced systems, which show promise of success on theoretical grounds, are those which recognize the various independently functioning grammatical units and structural strata of language. For such systems translation consists of a series of interstratal conversions, from morphemic to lexemic to sememic to semantic and from there through the strata of the target language, ending with strings of target-language graphemes.

R 3

26,550

Lindley, R.H. EFFECTS OF TRIGRAM-RECODING CUE COMPLEXITY ON SHORT-TERM MEMORY. J. verbal Learn. verbal Behav., Aug. 1965, 4(4), 274-279. (Eastern Michigan University, Ypsilanti, Mich.).

In Exp. I, the retention intervals were 0, 8, 20, & 32 sec; a trigram was presented either twice or was followed by an easy-to-decode (ED) recoding cue, (e.g., CAG-Cage) or by a difficult-to-decode (DD) cue, (e.g., CAG-Caught); the trigrams were either of high (HM) or low (LM) meaningfulness. The Ss were 24 men and women. The results (at  $p < .01$ ) were that: a) retention intervals, meaningfulness, the presence of recoding cues, and ease of decoding were statistically significant. In Exp. II, the same retention intervals were used; the trigram was either presented twice or preceded or followed by an ED cue; the trigrams were either of HM or LM. The results ( $p < .01$ ) were that retention intervals, recoding cues, and the meaningfulness by recoding cues interaction were statistically significant. The results showed that: a) in general the presence of recoding cues facilitated memory; b) ED items had more of a facilitative effect on memory than DD items; c) when the necessity for S to recognize the ED relationship was eliminated, recall of LM trigrams with recoding cues present was equal to recall of HM trigrams with cues present.

R 8

26,551

Brenner, Marcia S., Feldstein, S. & Jaffe, J. THE CONTRIBUTION OF STATISTICAL UNCERTAINTY AND TEST ANXIETY TO SPEECH DISRUPTION. J. verbal Learn. verbal Behav., Aug. 1965, 4(4), 300-305. (Research Dept., William Alanson White Institute, New York, N.Y.).

The present study examined the hypotheses that: a) there is a curvilinear relation between speech disruption and estimated uncertainty; and b) there is no relation between speech disruption and levels of test anxiety. 90 college undergraduates, classified on the basis of the Achievement Anxiety Test as high, medium, and low anxious, read aloud a set of passages ranging from a zero (most uncertain) to a 7th (least uncertain) order of statistical approximation to English. Speech disruption was scored in terms of a modification of Mahli's categories of non-Ah speech disturbances. An ANOVA and trend analysis were used to test the hypotheses. The analyses yielded significant linear, quadratic and cubic components of the uncertainty trend, thus supporting the first hypothesis. A significant monotonic relationship was also found between levels of test anxiety and number of non-Ah disturbances. Thus, the 2nd hypothesis was not confirmed. It was concluded that both uncertainty and anxiety play a role in the occurrence of speech disruption although a comparative evaluation of the relative influence of each is limited by the conditions of the experiment.

R 23

26,552

Markel, N.N. THE RELIABILITY OF CODING PARALANGUAGE: PITCH, LOUDNESS, AND TEMPO. J. verbal Learn. verbal Behav., Aug. 1965, 4(4), 306-308. (University of Florida, Gainesville, Fla.).

Previous investigators had suggested that reliable paralinguistic coding might be accomplished through the use of rating scales. The present study investigated the reliability of rating paralinguistic pitch, loudness, and tempo. The results indicated high inter-rater and test-retest reliabilities. High inter-rater reliability was also obtained from judges with no previous specialized training.

R 9

26,553

Postman, L. & Stark, Karen. THE ROLE OF RESPONSE SET IN TESTS OF UNLEARNING. J. verbal Learn. verbal Behav., Aug. 1965, 4(4), 315-322. (University of California, Berkeley, Calif.).

Evidence for the unlearning of first-list associations (A-B) during acquisition of a second list (A-C) has been obtained in unpaced tests of modified free recall (MMFR) in which S is required to reproduce both responses to each of the stimuli. The present experiment investigates the extent to which the loss of first-list associations in MMFR is attributable to a set established during IL and carried over into MMFR, viz., to restrict overt responses to those correct in the second list. In order to maximize the set to give first-list responses, a non-learning task was introduced between the end of IL and MMFR which required active recitation of all first-list associations. Comparison with appropriate control groups shows that: a) the set-inducing procedure increased the dominance of available first-list responses as indexed by the order of recall; but b) had no effect on the number of such responses recalled, i.e., left the amount of RI unchanged. It appears unlikely, therefore, that a loss of set is responsible for the reduced availability of first-list associations in MMFR.

R 9

26,554

Shiffrin, R. & Logan, F.A. PERFORMANCE SPEED AS A FUNCTION OF PRACTICE SPEED. J. verbal Learn. verbal Behav., Aug. 1965, 4(4), 335-338. (Yale University, New Haven, Conn.).

In a paired-associate learning task, 1 group was instructed to practice fast and the other instructed to practice slowly, everything else being held constant. When each S reached a set criterion of learning, he was tested under instructions to perform as rapidly as possible. The fast-practice group performed at a significantly faster rate than the slow-practice group.

R 4

26,555

Corcoran, D.W.J. RECOGNITION OF COMPLEX SOUNDS OVER THE LONG AND SHORT TERM. J. verbal Learn. verbal Behav., Oct. 1965, 4(5), 380-385. (Applied Psychology Research Unit, MRC, Cambridge, England).

A population of 8 stimuli was synthesized by dichotomizing 3 parameters, pitch (a), interruption rate (b), and amplitude modulation of the interruption (c). A single "Target" stimulus (a+b+c) had to be recognized after training under 5 different procedures. Group T had 32 presentations of a+b+c; C-, 16 a+b+c and 16 a+b-c; A-, 16 a+b+c and 16 a-b+c; A-B-C- had 16 a+b+c presentations with 16 a-b-c, and I had 16 a+b+c with a verbal description of the parameters. Tests of recognition were conducted after 1 min and 10 days. 3 theories were matched against the data. The most adequate theory for the short-term results was not the best explanation of long-term retention and vice versa.

R 9

26,556

McNulty, J.A. AN ANALYSIS OF RECALL AND RECOGNITION PROCESSES IN VERBAL LEARNING. J. verbal Learn. verbal Behav., Oct. 1965, 4(5), 430-436. (Dalhousie University, Halifax, Nova Scotia, Canada).

The purpose of this experiment was to demonstrate that the superiority of recognition over recall is due in part to the use of the whole item as the basic unit of measurement. About some items, Ss learn less than the whole item, and it is on the basis of this partial learning that items which cannot be recalled are, nevertheless, easily recognized. Lists of items of 3 different orders of approximation to English were given to Ss to learn. Retention was measured after each learning trial either by recall, standard recognition, or restricted recognition. The standard recognition test contained the original items plus an equal number of other items from the same order of approximation. In an effort to restrict the potential effectiveness of partial learning, the other recognition test contained incorrect alternatives differing from the original items in only 1 letter. Results of the experiment showed that when opportunities for partial learning to be of use in recognition were restricted, much of the difference between recall and recognition disappeared. Order of approximation and its interaction with method of measurement also had statistically significant effects.

R 14

26,557

Rose, D.E. & Malone, J.C. SOME ASPECTS OF THE ACOUSTICALLY EVOKED RESPONSE TO THE CESSATION OF STIMULUS. J. aud. Res., Jan. 1965, 5(1), 27-40. (Monterey Institute of Speech & Hearing, Monterey, Calif. & University of Oklahoma Medical Center, Oklahoma City, Okla.).

Some of the characteristics of the "off-effect" evoked potentials are discussed in relationship to frequency, rise-decay time, and duration of stimulus. No general change in the evoked potential was noted as a function of the frequency or rise-decay time. In 1 S, durations of 850 msec elicited an "off-effect" evoked potential, whereas a duration of 1500 msec was necessary in another S. The configuration of the "off-effect" looks similar to the "on-effect" evoked potential. It is hoped that the "off-effect" may add additional information with regard to acuity measurements to auditory stimuli.

R 13

26,558

Fletcher, J.L. & Loeb, M. RELATIONSHIPS FOR TEMPORARY THRESHOLD SHIFTS PRODUCED BY THREE DIFFERENT SOURCES. J. aud. Res., Jan. 1965, 5(1), 41-45. (USA Medical Research Lab., Fort Knox, Ky.).

12 Ss were exposed to 3 noise sources: 15 min. of 600-1200 cps at 113 db, 5 min. of 2400-4800 cps at 110 db, and 1000 pulses of impulse noise with peak intensity of 160 db. Mean TTS for each frequency and experimental condition are presented graphically. Correlations for TTS for each frequency for each condition and for the same frequencies across conditions were calculated. The results suggest that there is no general factor of susceptibility to acoustic trauma. There appears to be a number of processes underlying susceptibility to TTS at various test frequencies and these seem peculiar to the noises producing the TTS. (HEIAS)

R 4

26,559  
Hutton, C., Curry, E.T. & Fay, T.H., Jr., AUDITORY CONFUSIONS AMONG ALPHABET LETTERS. J. aud. Res., April 1965, 5(2), 109-117. (US Veterans Administration Regional Office, Atlanta, Ga.).

Alphabet letter confusions were found to be highly predictable and therefore useful in certain communication situations. Confusion patterns and vowel components form the basis for response predictions which need not be symmetrical. The response matrix disclosed a set of groups defined by common vowel component. These major groupings contained subgroupings which tended further to increase the prediction of letter confusions. Letter intelligibility appeared to be related in part to the number of letters in each group as well as syllable intelligibility. Some of the within group confusions were reciprocal, others were not. The nonreciprocal confusions and variations in vowel identification were related to current linguistic theory.

R 10

26,560  
Carter, N.L. & Gallo, R.P. EFFECT OF PEAK LEVEL ON THE LOUDNESS OF TRIANGULAR TRANSIENTS. J. aud. Res., April 1965, 5(2), 119-131. (Commonwealth Acoustic Laboratories, Sydney, Australia).

An experiment matching the loudness of triangular transients and continuous white noise, using a double staircase method with forced choice, is described. Transients at 3 pulse repetition rates and white noise at 4 levels were used. The rise time of the transients was 0.5 msec and the duration was 1.0 msec. The results are in close agreement with those of a previous experiment using the method of adjustment with white noise as the standard stimulus. Equal-loudness levels of transients and white noise disagree with those found in a further experiment on the effect of repetition rate on the loudness of transients. Some possible causes of this difference are discussed.

R 6

26,561  
Fletcher, J.L. RELIABILITY OF HIGH-FREQUENCY THRESHOLDS. J. aud. Res., April 1965, 5(2), 133-137. (USA Medical Research Lab., Fort Knox, Ky.).

Absolute thresholds in 2-KC steps from 4 through 16 KC were collected on 15 soldiers aged 18-25. Thresholds are not reported in sound pressure level. A provisional audiometric "zero" was established on high school students. Reliability coefficients for any frequency between any 2 of 3 separate threshold sessions were usually of the order of .80 or higher. Of 30 coefficients (3 for each of 10 frequencies) only 2 were insignificant. At 4, 6, & 8 KC the thresholds were compared to thresholds on the same 15 Ss from a standard Rudmose ARJ-5 audiometer. Validity coefficients were .71, .24, & .82 respectively. These are about as good as reliability coefficients on the ARJ-5 audiometer alone (.92, .42, & .54). It is concluded that an apparatus and technique exist to collect high-frequency absolute thresholds with some confidence.

R 2

26,562  
Fletcher, J.L. PROTECTION FROM HIGH INTENSITIES OF IMPULSE NOISE BY WAY OF PRECEDING NOISE AND CLICK STIMULI. J. aud. Res., April 1965, 5(2), 145-150. (USA Medical Research Lab., Fort Knox, Ky.).

15 young men and women were exposed once a day to impulses of 160 & 170 db SPL. Pre- and post-exposure Bekesy audiograms were collected at 3, 4, 5, 6, & 8 kc. In some cases the loud impulses were preceded either by a train of clicks or by white noise, at either 105 db or 120 db sensation level, designed to arouse the acoustic protective reflex. A significant effect of arousal stimuli did indeed appear on ANOVA, but all 4 arousal stimuli reduced TTS<sub>2</sub> about equally (10 db down from an average of 13.5 db with no reflex-arousal stimulus).

R 6

26,563  
Neely, K.K. & Forshaw, S.E. SPEAKING AND LISTENING THROUGH THE HEAD: I. THE INTELLIGIBILITY OF SPEECH RECORDED IN QUIET AT DIFFERENT POSITIONS ON THE HEAD AND THROAT. J. aud. Res., April 1965, 5(2), 151-157. (Defence Research Medical Labs., Toronto, Ontario, Canada).

The relative intelligibility of bone-conducted speech uttered in a quiet environment and picked up by each of 4 different transducers at 6 positions on the head and throat was investigated with 4 trained male speakers. The taped speech lists were heard by 16 normal-hearing listeners. Speech intelligibility scores and articulation index calculations gave similar relative estimates of intelligibility. Speech signals were most intelligible from on the forehead, next from the back of the head. The effects of position of the transducer upon the intelligibility of speech was independent of the type of transducer used but tended to vary between speakers. The results of this investigation formed the basis for the development of a 2-way bone-conduction communication system for divers. Work has been initiated to determine the effectiveness of the system in various noise environments.

R 12

26,564  
Ventry, I.M. & Chaiklin, J.B. THE EFFICIENCY OF AUDIOMETRIC MEASURES USED TO IDENTIFY FUNCTIONAL HEARING LOSS. J. aud. Res., July 1965, 5(3), 196-211. (Speech Pathology & Audiology Depts., Columbia University Teachers College, New York, N.Y. & Speech & Otolaryngology Depts., University of Minnesota, Minneapolis, Minn.).

This substudy evaluated the efficiency of 5 audiometric measures commonly used to identify patients with functional hearing loss. The measures were the pure-tone test-retest relationship, the spondee threshold and pure tone average (ST-PTA) relationship, the pure-tone Stenger test, the speech-Stenger test, and the D-S test. The criterion for a positive result on the ST-PTA measure was a 12 db discrepancy, and the criterion for a positive result on the other 3 measures (excluding the D-S test) was a 15 db discrepancy. The most efficient measure was ST-PTA which correctly identified 70% of the Ss. The pure-tone test-retest measure identified 66% of the Ss. These 2 measures had false-negative rates of 30% & 33%, respectively. Combined, they resulted in 85% correct identifications. The Stenger tests were the least efficient measures, particularly when administered to patients who presented small interaural threshold differences. The Stenger tests were more efficient in identifying Ss who presented more than a 40 db interaural threshold difference. The D-S test described by Doerfler & Epstein was evaluated with 76 men assigned to 2 groups: 40 Ss with and 36 without functional hearing loss. It was found that the D-S test, interpreted with the available norms, did not adequately differentiate Functional Group Ss from Non-functional Group Ss. A revision of several of the norms significantly improved the effectiveness of the test. It was suggested that the D-S test's complexity of administration and interpretation weakens its utility as a screening test for functional hearing loss.

R 6

26,565

Ventry, I.M. & Chaiklin, J.B. EVALUATION OF PURE-TONE AUDIOGRAM CONFIGURATIONS USED IN IDENTIFYING ADULTS WITH FUNCTIONAL HEARING LOSS. *J. aud. Res.*, July 1965, 5(3), 212-218. (Speech Pathology & Audiology Depts., Columbia University Teachers College, New York, N.Y. & Speech & Otolaryngology Depts., University of Minnesota, Minneapolis, Minn.).

64 veterans in a Functional Hearing Loss Group and 36 in a Non-functional Hearing Loss Group were compared. The pure-tone ac audiograms for all Ss were coded and submitted to a judging panel of 3 experienced audiologists. The judges' tasks were: a) to determine whether an audiogram could be characterized by 1 or more of 5 statements, drawn from the literature, describing pure-tone ac audiogram configurations associated with functional hearing loss; b) to determine whether an audiogram corresponded in shape and hearing level to either of 2 audiograms described in the literature as "typical" of functional hearing loss; and c) to determine whether in their opinion an audiogram was "saucer-shaped". There were no significant differences between groups for any of these 3 judgments. Composite configurations suggested that some type of equal-loudness criterion may be utilized by some patients with functional hearing loss when they respond to pure-tone stimuli, and that the nature and extent of the underlying organic hearing loss may affect the shape of the configuration. It was concluded that the saucer audiogram has limited utility in identifying adult male veterans with functional hearing loss.

R 1

26,566

Chaiklin, J.B. & Ventry, I.M. PATIENT ERRORS DURING SPONDEE AND PURE-TONE THRESHOLD MEASUREMENT. *J. aud. Res.*, July 1965, 5(3), 219-230. (Speech Pathology & Audiology Depts., Columbia University Teachers College, New York, N.Y. & Speech & Otolaryngology Depts., University of Minnesota, Minneapolis, Minn.).

Patient errors during spondee-threshold (ST) measurement, and false-alarm responses (responses not preceded by stimuli) during pure-tone audiometry, were examined in this substudy as possible differentiating indices. Ss with functional hearing loss differed in that they yielded: a) more half-stimulus responses ("fare" for "farewell"); b) more 1-syllable responses not containing part of the stimulus; c) more no-response errors and total errors; and d) fewer errors that were spondee errors from the stimulus list. Also, 18% of the Functional Group Ss presented "no response" errors as their only type of error, whereas only 3% of the Non-functional Group did so. A Spondee Error Index (SERI) was constructed using differentiating ST error categories. In an independent evaluation, the SERI correctly identified 85% of the functional Ss tested, had a false-positive rate of only 13%, and a false-negative rate of 15%. The non-functional Group yielded a mean of 9.2 false-alarm responses, the Functional Group only 2.0 ( $p < .001$ ). Of the Functional Group, 78% never gave a false-alarm response, but only 14% of the Non-functional Group failed to do so. When the SERI and absence of false-alarm responses are used together as criteria, 79% of the Functional Ss could be identified correctly and the false-positive rate reduced to zero. Requiring a positive result on both criteria or a positive result on the ST-PTA difference criterion increased correct identifications in the Functional Group to 85%.

R 1

26,567

Ventry, I.M., Trier, T.R. & Chaiklin, J.B. FACTORS RELATED TO PERSISTENCE AND RESOLUTION OF FUNCTIONAL HEARING LOSS. *J. aud. Res.*, July 1965, 5(3), 231-240. (Speech Pathology & Audiology Depts., Columbia University Teachers College, New York, N.Y.).

45 veterans with functional hearing loss underwent a complete audiological and psychological evaluation. Brief counseling, given by the audiologists, consisted primarily of a non-threatening discussion of the nature of the audiometric discrepancies and discussion of factors that might have caused the discrepancies. This procedure was successful for 25 Ss, but 20 Ss continued to present functional hearing loss despite repeated counseling and testing. Ss whose functional hearing loss persisted presented significantly larger functional components for pure-tone thresholds and for Spondee thresholds. An initial functional component of less than 35 db was found critical for predicting later resolution. The 2 groups were similar on many social and psychological characteristics with relatively few significant intergroup differences. Persistence of functional hearing loss may have been related to lower intelligence, self-descriptions characterized by excessive moral virtue, and a tendency toward indirect rather than direct means of expressing hostility. On the basis of the psychological results, some tentative psychodynamic explanations were provided to account for resolution and persistence of functional hearing loss.

R 7

26,568

Trier, T.R. & Levy, R. SOCIAL AND PSYCHOLOGICAL CHARACTERISTICS OF VETERANS WITH FUNCTIONAL HEARING LOSS. *J. aud. Res.*, July 1965, 5(3), 241-256. (Langley Porter Neuropsychiatric Institute, San Francisco, Calif.).

This substudy obtained information about the social and psychological characteristics of patients with functional hearing loss. "Blind" evaluations of the Functional Group and Non-functional Group Ss were conducted by a psychiatrist and by a psychologist. Evaluation procedures consisted of interviews, psychological tests (Wechsler Adult Intelligence Scale, Rorschach, Minnesota Multiphasic Personality Inventory, Cornell Medical Index), personality trait ratings, and topical abstracting of each veteran's claims folder. Results provided partial support for predictions that the Functional Group would reveal lower socio-economic status, intellectual limitation, grosser emotional disturbance, and more denial, concern over physical symptoms, and exploitation of physical symptoms. Predictions that the Functional Group would manifest more discontinuity of life experiences, dependency, and social isolation were not supported. A psychodynamic explanation of functional hearing loss was proposed.

R 12

26,569

Ventry, I.M., Chaiklin, J.B., Deutsch, W.W., Levy, R., et al. BIBLIOGRAPHY ON FUNCTIONAL HEARING LOSS. *J. aud. Res.*, July 1965, 5(3), 262-272. (Speech Pathology & Audiology Depts., Columbia University Teachers College, New York, N.Y.).

This bibliography is the result of a thorough search of the literature on or related to functional hearing loss. Undoubtedly some articles and books, particularly those written in a foreign language or those published prior to 1900, have inadvertently been omitted. In so far as possible, each reference was checked for accuracy and relevance by going to the original source. In some instances, secondary sources and standard reference books were used to confirm the accuracy of the entry.

R Many



26,570

Simon, G.R., Northern, J.L. & Balas, R.F. VALIDITY AND RELIABILITY OF THE SAL TECHNIQUE. J. aud. Res., Oct. 1965, 5(4), 279-284. (US Veterans Administration Hospital, Denver, Colo.).

SAL scores were determined by Bekesy discrete-frequency audiometry for 20 normal ears under test-retest conditions of normal and plugged listening, the latter with the use of ear-plugs. Narrow bands of noise centered at each of 5 octaves 250-4000 cps were used for masking. SAL scores were calculated using average masked threshold rather than masking as the normative data. The SAL technique allows for valid and highly reliable determination of the sensorineural sensitivity under both listening conditions. The data support the use of the SAL test as a clinical procedure.

R 11

26,571

Merrell, H.B. & Atkinson, C.J. THE EFFECT OF SELECTED VARIABLES UPON DISCRIMINATION SCORES. J. aud. Res., Oct. 1965, 5(4), 285-292. (Southern Illinois University, Carbondale, Ill.).

The effect upon W-22 discrimination scores, using 1 patient and a 25-member auditor panel, was studied as a function of verbal vs written patient response, experience of auditors, scoring form used by auditors, and fidelity of talkback system. The patient's mode of response and the scoring form used by the auditors were statistically and clinically significant factors. Auditor error was quantified by comparing the patient's written responses with the auditor's judgment "correct" or "incorrect" relative to the patient's verbal response. Auditors tended to err in favor of counting incorrect responses as correct. Referring to a typewritten list of test items reduces auditor error. Requiring some form of written response from the patient may be expected to produce more reliable discrimination scores than requiring only oral repetition of test items.

R 10

26,572

Martin, F.N., Bailey, H.A.T., Jr. & Pappas, J.J. THE EFFECT OF CENTRAL MASKING ON THRESHOLD FOR SPEECH. J. aud. Res., Oct. 1965, 5(4), 293-296. (University of Arkansas School of Medicine, Little Rock, Ark.).

In 10 normal-hearing Ss a threshold shift produced for cold running speech by a thermal noise in the contralateral ear was demonstrated. An appropriate correction factor of 4 to 8 db may be employed when SRTs are measured in the presence of contralateral masking.

R 7

26,573

McDermid, C.D. SOME CORRELATES OF CREATIVITY IN ENGINEERING PERSONNEL. J. appl. Psychol., Feb. 1965, 49(1), 14-19. (Humber, Mundie & McClary, Evanston, Ill.).

This study tested recently developed criteria and predictors of scientific creativity in an industrial setting--specifically, in an applied engineering division of a company manufacturing consumer goods. The California Psychological Inventory (CPI), the Vocational Preference Inventory (VPI), the Welsh Figure Preference Test (FPT), the Social Insight Test (SIT), Gough's Adjective Check List (ACL), the Concept Mastery Test (CMT), and the Biographical Information (form) for Research and Scientific Talent (BIRST) were correlated with supervisor and peer ratings of creativity in 58 engineering and technical personnel. The most significant correlations were obtained between the criteria and the ACL and BIRST. These results confirm other research findings which suggest that self-reports and biographical data, especially those which describe interests or achievements of a creative nature, are currently the most effective predictors of creative performance in real-life situations.

R 13

26,574

Watley, D.J. PERSONAL ADJUSTMENT AND PREDICTION OF ACADEMIC ACHIEVEMENT. J. appl. Psychol., Feb. 1965, 49(1), 20-23. (University of Minnesota, Minneapolis, Minn.).

This study was designed to investigate the relationship between personal adjustment and predictability of academic achievement in a business college. The hypothesis tested was that "better" adjusted students would be more predictable than maladjusted students. Predictability was determined by correlation coefficients between aptitude test (CEE-B-M & CEE-B-V) scores and both 1st-quarter and 1st-year grades. The sample consisted of 188 freshmen male business students who were classified into "positive-", "average-", and "negative-" adjustment groups on the basis of means of the 10 Guilford-Zimmerman Temperament Survey (GZTS) trait raw scores. Comparisons of the adjustment groups on correlations between the mathematics and verbal scores and grade averages indicated that the adjustment groups did not differ in terms of academic predictability. Analysis of differences between the groups on both high school achievement and college achievement revealed, however, that the positive-adjustment group earned significantly higher grades than the negative group. These results indicated that although the adjustment groups did not appear to be significantly different in terms of academic predictability, a definite relationship did exist between the groups on levels of achievement.

R 2

26,575

Lodahl, T.M. & Kejner, Mathilde. THE DEFINITION AND MEASUREMENT OF JOB INVOLVEMENT. J. appl. Psychol., Feb. 1965, 49(1), 24-33. (Graduate School of Business & Public Administration, Cornell University, Ithaca, N.Y.).

Job involvement is the degree to which a person is identified psychologically with his work, or the importance of work in his total self-image. Very little is presently known about this class of job attitudes, although speculations about it are implicit in much of the work on industrial motivation, especially that which deals with "participation." The purpose of the present research was to define job involvement, develop a scale for measuring it, gather evidence on the reliability and validity of the scale, and to learn something about the nature of job involvement through its correlation with other job attitudes. This paper describes the development and validation of a scale measuring job involvement; the resulting scales are presented, and the relation between job involvement and other job attitudes is discussed.

R 23

26,576

Dicken, C.F. & Black, J.D. PREDICTIVE VALIDITY OF PSYCHOMETRIC EVALUATIONS OF SUPERVISORS. J. appl. Psychol., Feb. 1965, 49(1), 34-47. (Stanford University, Palo Alto, Calif.).

31 higher level employees in 1 firm and 26 in another were assessed by objective test batteries. Clinical interpretations of test data, test scores, and other predictors were analyzed with reference to criterion personality ratings and management decisions at a follow-up point of 3 1/2 yrs. for the 1st sample and 7 yrs. for the 2nd. Predictive validity of test assessments was generally satisfactory in the 1st sample, although not pragmatically superior to that of certain objective data. Prediction was less satisfactory in the 2nd sample, but more unique to test data. A matching study indicated some correspondence of test reports and criterion personality sketches in the 2nd sample. Uninterpreted test scores were not generally valid except as measures of intelligence. Implications of the sample differences and of the method are discussed.

R 20

26,577

Hershbarger, W.A. & Terry, D.F. TYPOGRAPHICAL CUEING IN CONVENTIONAL AND PROGRAMED TEXTS. J. appl. Psychol., Feb. 1965, 49(1), 55-60. (American Institute for Research, Palo Alto, Calif.).

This study assessed the instructional effectiveness of simple and complex forms of typographical cueing in both conventional and programed texts. A total of 118, pretested, 8th-grade students read an 8th-grade history lesson and were later retested. Analysis of gain scores revealed that: a) simple typographical cueing distinguishing core from enrichment content enhances the ratio of important to unimportant content learned without affecting the total amount learned; b) complex typographical cueing distinguishing 5 categories of lesson content fails to increase learning of either core or enrichment content; c) the programed or quizzed text is more effective than the conventional text; and d) the effects of simple typographical cueing and programed quizzing appear independent and additive.

R 11

26,578

Welsh, P., Antoinetti, J.A. & Thayer, P.W. AN INDUSTRY-WIDE STUDY OF PROGRAMED INSTRUCTION. J. appl. Psychol., Feb. 1965, 49(1), 61-73. (Life Insurance Agency Management Association, Hartford, Conn.).

In November 1963, the Life Insurance Agency Management Association completed a study of the effectiveness of a 1625-frame, self-instructional text on life insurance fundamentals, developed in cooperation with the American Institute for Research. The 2x2x3 factorial design involved: use of a review book, availability of confirmation for each response, and response mode. Over 1500 people in 7 companies in classroom and field settings participated as well as home office employees in an 8th company to study 4- and 16-week retention. The use of a comprehensive review program resulted in slightly and reliably greater achievement on both immediate testing and retention tests 4 & 16 weeks later. Trainees receiving confirmation of the accuracy of their responses were generally, and sometimes significantly, inferior in achievement to trainees not receiving confirmation. Trainees did not differ in achievement or attitude toward the program depending on writing, saying their answers, or choosing either of these response modes; those who said their answers took less time than the others. Pretest individual differences were not reduced by exposure to the programed texts.

R 28

26,579

Richards, J.M., Jr., Taylor, C.W., Price, P.B. & Jacobsen, T.L. AN INVESTIGATION OF THE CRITERION PROBLEM FOR ONE GROUP OF MEDICAL SPECIALISTS. J. appl. Psychol., April 1965, 49(2), 79-90. (University of Utah, Salt Lake City, Utah).

The sample consisted of 190 Utah physicians fully certified as specialists by an American Board. 80 scores relevant to the performance of these physicians were intercorrelated and factor analyzed using the principal components solution based on eigenvalues and eigenvectors. The 29 factors which had an eigenvalue greater than 1.00 were rotated by the varimax procedure and interpreted. The most important finding was the great criterion complexity for this group of medical specialists. This complexity suggests that one cannot adequately measure physician performance on the basis of a single score or a few scores. Instead, one must obtain a relatively large number of scores. Performance in both premedical and medical education was independent of performance as a physician.

R 19

26,580

Siegel, A.I. & Federman, P. DEVELOPMENT OF A PAINT SCHEME FOR INCREASING AIRCRAFT DETECTABILITY AND VISIBILITY. J. appl. Psychol., April 1965, 49(2), 93-105. (Applied Psychological Services, Wayne, Penn.).

5 studies were performed in order to derive a paint coloration scheme which will allow maximum aircraft visibility and detectability. It was found that maximum visibility may be expected from a large, squarelike, unbroken fluorescent red-orange area and a secondary area possessing color and brightness contrast with the fluorescent red-orange.

R 11

26,581

Mudd, S.A. EXPERIMENTAL EVALUATION OF BINARY PURE-TONE AUDITORY DISPLAYS. J. appl. Psychol., April 1965, 49(2), 112-121. (Purdue University, Lafayette, Ind.).

The frequency, intensity, duration, and interaural difference (direction) dimensions of pure tone were evaluated singly and in combination at 3 comparable levels of discriminability in order to determine their relative effectiveness as binary cueing stimuli for an instrument monitoring task. The use of such signals decreased search time and reduced (Ss') tendencies to be differentially attentive to the various sectors of the information display. No further reduction in search time occurred with 3- and 4-dimensional displays than with 2-dimensional displays. Frequency proved to be the most effective dimension for purposes of cueing. Intensity was least effective. Direction and Duration were of moderate effectiveness.

R 4

26,582

Levy, S. & Stene, D. Miriam. CONSTRUCT REVALIDATION OF A FORCED-CHOICE RATING FORM. *J. appl. Psychol.*, April 1965, 49(2), 122-125. (Pillsbury Company, Minneapolis, Minn.).

A forced-choice rating form was revalidated by using a type of construct validation based on the hypothesis that a manager's effectiveness is reflected in the performance level of his subordinates. 11 plant managers were ranked on overall effectiveness by 3 independent judges, and the relationship between these rankings and the average performance report scores of 142 first-line supervisors in the respective plants was determined by analysis of variance and correlational techniques. Results showed a significant overall relationship between plant-manager rankings and production-supervisor scores on the forced-choice form ( $p=.005$ ) and significant correlations on 2 of the 6 sub-scales, with the highest relationship apparent in the Human Relations area ( $p=.025$ ). The findings support the hypothesis of a relationship between management effectiveness and subordinate performance, and provide evidence to indicate continued validity of the rating instrument.

R 5

26,583

Exline, R.V. & Long, Barbara H. AN APPLICATION OF PSYCHOLOGICAL SCALING METHODS TO CONTENT ANALYSIS: THE USE OF EMPIRICALLY DERIVED CRITERION WEIGHTS TO IMPROVE INTERCODER RELIABILITY. *J. appl. Psychol.*, April 1965, 49(2), 142-149. (Center for Research on Social Behavior, University of Delaware, Newark, Del.).

A method is described in which a psychological scaling technique is applied to the analysis of the contents of written messages in order to provide a more precise metric for such measurement. The attribute to be measured was the extent to which each message communicated an attempt on the part of the writer to control the group's decision of procedures. 2 scales were developed, a logical scale comprised of 9 categories, and an empirical scale based on the application of Thurstone's successive interval technique to a set of written messages. The empirical scale was found to have a higher reliability than the logical scale with untrained coders. Possible reasons for the superiority of the empirical scale were discussed, and suggestions made concerning its use in future research.

R 16

26,584

Shaw, M.E. & Blum, J.M. GROUP PERFORMANCE AS A FUNCTION OF TASK DIFFICULTY AND THE GROUP'S AWARENESS OF MEMBER SATISFACTION. *J. appl. Psychol.*, June 1965, 49(3), 151-154. (University of Florida, Gainesville, Fla.).

This experiment investigated the hypothesis that group effectiveness increases with increased member awareness of group satisfaction, and that this effect is greater for difficult than for easy tasks. 5-person groups attempted 3 tasks differing in difficulty, under 3 conditions of satisfaction feedback: no feedback, overt feedback, and covert feedback. In the overt condition, Ss publicly indicated their satisfaction with the problem-solving process, whereas in the covert condition their satisfaction was indicated anonymously. The results supported the hypothesis. It was suggested that valid communication of satisfaction leads to more complete use of members' contributions, and hence improves performance.

R 10

26,585

Bowen, H.M. & Guinness, G.V. PRELIMINARY EXPERIMENTS ON KEYBOARD DESIGN FOR SEMIAUTOMATIC MAIL SORTING. *J. appl. Psychol.*, June 1965, 49(3), 194-198. (Dunlap & Associates, Inc., Darien, Conn.).

Mail sorting by keyboards will require operatives either to remember a digitation for each address ("memory encoding") or key certain selected characters from the address ("extraction encoding"). Keyboards may be chord (multiple depressions per stroke) or sequential (single keys in succession). 3 preliminary experiments indicated: a) in sequential keying a key stroke takes approximately 0.3 sec., hence keyboards with many keys and requiring few key strokes per encoding are preferable; b) for memory encoding a chord keyboard with many keys (24) is superior to a smaller chord keyboard and a sequential keyboard; and c) for extraction encoding a typewriter and a 24-key chord keyboard are equal in performance. Training and practice requirements associated with different keyboards are suggested for future research.

R 4

26,586

Jones, D.H. TRAINING INDUSTRIAL EXECUTIVES IN READING: A METHODOLOGY STUDY. *J. appl. Psychol.*, June 1965, 49(3), 202-204. (University of Detroit, Detroit, Mich.).

A controlled-method study of gains achieved and retained by industrial executives as a result of reading improvement training. 4 groups consisting of 56 executives were equated on reading-ability score and related criteria. 1 group served as a control, while 3 experimental groups were trained with different methods. Each group received 16 hrs. of training. Progress and permanence were evaluated by equated forms of a reading test. Results were analyzed by t tests between and within groups. No significant differences were found between methods. Very significant progress and retention was found within all groups. Industrial executives can be trained to read more efficiently, and do retain that efficiency. Mechanical aids are not required for reading training of executives.

R 10

26,587

Hulin, C.L. & Smith, Patricia C. A LINEAR MODEL OF JOB SATISFACTION. *J. appl. Psychol.*, June 1965, 49(3), 209-216. (University of Illinois, Urbana, Ill. & Cornell University, Ithaca, N.Y.).

Data relevant to 5 separate areas of a worker's job satisfaction (satisfaction with: work, pay, promotion opportunities, co-workers, and supervision) and 6 independent variables (age, tenure on the job, tenure with the company, job level, salary, and salary desired minus salary received) were gathered from a sample of 185 male workers and 75 female workers employed in 2 plants of an electronics manufacturing firm in New England. Multiple-regression analyses were done on these data to determine the validity of 2 hypotheses of Herzberg that age and tenure bear U-shaped relationships to job satisfaction. No support was found for these hypotheses. For the male workers a linear model of job satisfaction predicted work and pay satisfaction. None of the other dependent variables for the male or female workers could be predicted significantly and consistently. An explanation based on discrepancies between expectations and environmental return is offered.

R 13

26,588

Crambert, A.C. & Droege, R.C. COMPARABILITY OF SCORES ON DIFFERENT TYPING TESTS. J. industr. Psychol., March 1965, 3(1), 15-18. (US Employment Service, Washington, D.C.).

The results of this study indicated that testing with the US Employment Service typing test yields results which are comparable to those obtained on the US Civil Service Commission typing test, a test with different content and format. Differences in mean speed and error scores between the 2 tests were negligible, and correlations between scores on the 2 tests were almost identical to correlations between scores on 2 forms of the USES test. These results indicate that variations in length, type of material in the text and format of typing tests may not be associated with variations in test scores. In the second phase of the study, it was found that correlations between words per minute scores on 2 5-min. administrations of the USES typing test were the same as correlations between words per minute scores on 2 10-min. administrations. Correlations for error scores and net words per minute scores were somewhat lower for the 5-min. length. This analysis indicated that time limit has some effect on reliability of measurement.

R 1

26,589

Kirchner, W.K. RELATIONSHIPS BETWEEN THE STRUCTURED OBJECTIVE RORSCHACH TEST AND THE CALIFORNIA PSYCHOLOGICAL INVENTORY. J. industr. Psychol., March 1965, 3(1), 24-30. (Minnesota Mining & Manufacturing Company, St. Paul, Minn.).

Scores on the California Psychological Inventory, a structured verbal personality test, were correlated with those of the Structured-Objective Rorschach test, a structured version of the unstructured Rorschach for 2 separate groups, graduate students and industrial managers. In general, no consistent pattern of correlations emerged for the 2 groups and the number of statistically significant correlations was fairly close to what would be expected by chance alone. It was suggested that the S-O-R and CPI did not measure the same factors and that the S-O-R might not substitute too well for verbal structured personality tests.

R 2

26,590

Stander, N.E. A LONGITUDINAL STUDY OF SOME RELATIONSHIPS AMONG CRITERIA OF MANAGERIAL PERFORMANCE AS PERCEIVED BY SUPERIORS AND SUBORDINATES. J. industr. Psychol., 1965, 3(2), 43-51. (Westinghouse Electric Corporation, Baltimore, Md.).

This study investigated certain relationships among criteria of managerial success as perceived by superiors and subordinates between 1959 & 1962. A principle axis factor analysis of 23 criteria of managerial success, derived from 4 preliminary factor analyses and 4 kinds of descriptive information, suggests the following conclusions: a) both superiors and subordinates view decision-making and organizational ability as the single most important attribute of successful managerial performance; b) human relations skill was a second important dimension of managerial performance identified by both superiors and subordinates; c) a manager's salary level was found to be directly related to the extent he was perceived by his superior as an effective planner and organizer as well as to the extent he was considered by his superior to be skillful in human relations; d) in general, it appears that subordinates view intelligence as an essential component of high caliber managerial performance; e) subordinates perceived the ability to promote group cohesiveness as a significant characteristic of managerial performance; f) by and large, the more hrs. a manager participated in formal company training programs the more likely he was to be judged effective by his subordinates; g) subordinates viewed older managers as less effective than younger managers.

R 12

26,591

Grigg, A.E. & Filer, R.J. NORMS FOR SCIENTISTS AND ENGINEERS ON SRA VERBAL TEST. J. industr. Psychol., 1965, 3(2), 52-54. (Psychological Consultants, Inc., Richmond, Va.).

Norms supplied in the manual of the science research associates verbal test (1956) are not applicable to young scientists and engineers. The population on whom industrial norms of the SRA Verbal Test is based "was composed mainly of industrial worker type Ss, and Ss from the higher echelon positions were not well represented." The manual does not specify the exact number of individuals on whom the norms are based. The purpose of the present paper is to report the scores of a group of young scientists and engineers on the SRA Verbal Test. The norms reported are based on 180 recent graduates in science and engineering who were tested and interviewed as part of their employment screening for a large national chemical company.

R 2

26,592

Kirchner, W.K. RELATIONSHIPS BETWEEN SUPERVISORY AND SUBORDINATE RATINGS FOR TECHNICAL PERSONNEL. J. industr. Psychol., 1965, 3(3), 57-60. (Minnesota Mining & Manufacturing Company, St. Paul, Minn.).

The comparison of subordinate ratings of their own job performance against similar supervisory ratings of this job performance for a group of 92 technical hires has revealed the following: a) supervisors rated more generally, tending to rate persons pretty much alike on all of the various scales. They exhibited more "halo". Subordinates tended to be more specific and distinct in their self-ratings; b) in general, subordinates tend to rate themselves somewhat more favorably than do their supervisors; c) ratings on human relations seem to be least associated with ratings of over-all job performance and with ratings of other measures of job performance. This would suggest that human relations ability or the ability to get along well with others is not highly important to technical job success. This has some significance, of course, for selection and placement because most evidence suggests that individuals who are more personable are more likely to create a favorable impression at time of hire and thus more likely to be hired. To some extent then, this could penalize technical persons who are not particularly adept at human relations, yet who might rank high on such things as technical competence, creative ability and the like. Certainly, human relations ability, in and of itself, should not be considered a highly critical factor in terms of technical success.

26,593

Kaufman, H.G. JOB DESIGN AND ADJUSTMENT TO COMPUTER AUTOMATION. *J. Industr. Psychol.*, 1965, 3(3), 61-67. (New York University, New York, N.Y.).

The significant negative correlation between job satisfaction and the percentage of time spent at monitoring and control tasks reported by computer operators, as well as the significant positive correlations for satisfaction with both variety and achievement, suggests a job design which would reduce the time spent at operating the computer by including a variety of additional tasks (e.g., programming and machine maintenance). The results also suggest that boredom is related to a lack of both variety and achievement. Boredom tends to increase as the amount of time spent operating the computer increases and the results indicate that it may be an important contributor to job dissatisfaction. Those operators doing programming revealed a greater satisfaction with their jobs. This result is understandable since programming is usually a higher status job than computer operating and is usually rated higher, thereby providing greater possibilities of achievement and upward mobility. No definite conclusions may be drawn regarding the effects of social isolation since there were only 4 operators who indicated spending 75% or more of their time alone. The data suggest that up to approximately 2/3 of the operator's time be spent monitoring and control tasks, thereby allowing more time for carrying out a variety of tasks that would allow for possibilities of greater achievement while at the same time permitting fuller utilization of the worker's abilities and skills as well as increasing his control over job performance.

R 32

26,594

Kaufman, H.G. & Ritti, R.R. PRODUCT IDENTIFICATION AND MORALE OF ENGINEERS. *J. Industr. Psychol.*, 1965, 3(3), 68-73. (New York University, New York, N.Y.).

This study has yielded additional evidence that the morale climate for development engineering groups is related to their degree of identification with important products. It is suggested that product identification is an important ego motive for development engineers. As such, strong identification is ego enhancing and consequently provides an effective basis for building a high morale climate. The evidence analyzed thus far indicates that strong product identification combined with local management assists in creating the "best" overall morale and decision-making climate for engineering development laboratories.

R 9

26,595

Elfner, L.F. & Carlson, Carol. LATERALIZATION OF PURE TONES AS A FUNCTION OF PROLONGED BINAURAL INTENSITY MISMATCH. *Psychonomic Science*, Jan. 1965, 2(1), 27-28. (Kent State University, Kent, Ohio).

Pre-exposure of the right ear to amplification of auditory input by means of a hearing aid produced decrements in the ability to lateralize pure tones under dichotic presentation. The decrement in lateralization function increased with an increase in pre-exposure duration. Lateralization decrement was not affected by the signal frequency.

R 6

26,596

Kornblum, S. RESPONSE COMPETITION AND/OR INHIBITION IN TWO-CHOICE REACTION TIME. *Psychonomic Science*, Jan. 1965, 2(2), 55-56. (University of Michigan, Ann Arbor, Mich.).

A 2-choice RT experiment was conducted in which it was demonstrated that the RT for a particular finger is subject to change depending on the alternatives with which it is paired. This finding, it is argued, raises questions regarding the adequacy of controls which select the experimental data from only 1 finger in an effort to minimize the effects of inter-finger variability. It is also a demonstration of R-R compatibility effects, and as such, lends experimental support to the hypothesis that a measurable portion of the RT interval is consumed by the processes associated with the inhibition of competing incorrect response alternatives.

R 4

26,597

Lee, W. ROC CURVES FOR RECOGNITION OF VISUAL PATTERNS. *Psychonomic Science*, Jan. 1965, 2(2), 51-52. (University of California, Berkeley, Calif.).

The confidence rating technique was used to generate z-deviate ROC curves for the recognition of 1 of 2 possible visual patterns. The patterns were O's and Landolt rings. The mean linear slopes for each pattern pair were about 45°, but there was some evidence of downward curvilinearity.

R 2

26,598

Smith, W.M. VISUAL RECOGNITION: FACILITATION OF SEEING BY SAYING. *Psychonomic Science*, Jan. 1965, 2(2), 57-58. (Dartmouth College, Hanover, N.H.).

The vocalization of 3-letter and 3-syllable words was used to trigger during vocalization the visual exposure of words which were the same as the words spoken, or different. When a presented word matched the vocalized word, visual recognition was enhanced.

R 3

26,599

McLaughlin, D.H. & Luce, R.D. STOCHASTIC TRANSITIVITY AND CANCELLATION OF PREFERENCES BETWEEN BITTER-SWEET SOLUTIONS. *Psychonomic Science*, Feb. 1965, 2(3), 89-90. (University of Pennsylvania, Philadelphia, Penn.).

Preferences between 25 pairs of stimuli composed from 25 different sucrose-quinine sulfate solutions were obtained from 3 Ss in an attempt to test the product rule; strong, moderate, and weak stochastic transitivity; and strong, moderate, and weak stochastic cancellation. The data seem to support strong, and hence moderate and weak, stochastic transitivity as well as moderate, and hence, weak stochastic cancellation. The product rule and strong stochastic cancellation appear to be more dubious.

R 1

26,600

McLaughlin, S.C. & Rifkin, K.I. BINOCULAR FUSION NOT AFFECTED BY OBSERVER'S INTERPRETATION OF THE STIMULUS. Psychonomic Science, Feb. 1965, 2(3), 67-68. (Tufts University, Medford, Mass.).

Prism vergence thresholds were compared under 2 conditions: a) in which each S believed that he was looking at a single object with both eyes; and b) in which each S believed that he was looking at 2 different objects, 1 seen from each eye. Thresholds were not significantly different under the 2 conditions.

R 4

26,601

Weinstein, Naomi & Haber, R.N. A U-SHAPED BACKWARD MASKING FUNCTION IN VISION. Psychonomic Science, Feb. 1965, 2(3), 75-76. (University of Chicago, Chicago, Ill. & University of Rochester, Rochester, N.Y.).

Errors in discriminating the letters O & D in a forced-choice design were measured with 4 Ss when the exposure of either letter was accompanied or followed by a ring encircling it. The delay between offset of the letter and onset of the ring varied from concurrent presentation of both, through 0 msec. delay to 120 msec. delay, in steps of 10 msec. The letter and ring were presented randomly in 1 of 4 positions in a centrally located row, with the other 3 positions always empty. Accuracy was a u-shaped function of the delay between letter and ring for all 4 Ss. An explanation of the discrepancy between these findings and those of Eriksen & Collins (1964) is offered.

R 11

26,602

Mayzner, M.S. & Schoenberg, K.M. SHORT-TERM RETENTION AND PRESENTATION RATE. Psychonomic Science, Feb. 1965, 2(4), 111-112. (New York University, New York, N.Y.).

4 groups of 30 Ss each were presented with lists of numbers 18 digits in length on a memory drum, 1 digit exposed at a time, at 4 different presentation rates, 4 sec. per digit, 2 sec. per digit, 1 sec. per digit, & .50 sec. per digit. The 4 sec. rate was presented for 1 cycle, the 2 sec. rate for 2 cycles, the 1 sec. rate for 4 cycles, and the .50 sec. rate for 8 cycles, holding total display time constant (72 sec.) for all 4 conditions. Short-term retention decreased as presentation rate increased, even with total display time held constant.

R 8

26,603

Swenson, R.G. INCENTIVE SHIFTS IN A THREE-CHOICE DECISION SITUATION. Psychonomic Science, Feb. 1965, 2(4), 101-102. (University of Michigan, Ann Arbor, Mich.).

The effects of changes in incentive conditions were examined in a 3-choice, probability learning task. After 160 trials 2 groups of 10 Ss each were switched from low to high incentive conditions (No Payoffs to Payoffs) or vice versa, while 2 control groups of 10 Ss each performed under either low or high incentive conditions throughout. The switch from high to low incentives produced a decrease in the rate of predicting the most frequent event, but a corresponding increase was not observed for the group switched in the opposite direction.

R 6

26,604

Rock, I. ADAPTATION TO A MINIFIED IMAGE. Psychonomic Science, Feb. 1965, 2(4), 105-106. (Yeshiva University, New York, N.Y.).

When Ss are exposed to an optically minified image, objects at first appear diminutive. It was shown that with continued exposure a process of adaptation takes place in the direction of veridical size perception. Purely visual information is a sufficient condition and movement is not a necessary condition for such adaptation.

26,605

McLaughlin, S.C. & Rifkin, K.I. CHANGE IN STRAIGHT AHEAD DURING ADAPTATION TO PRISM. Psychonomic Science, Feb. 1965, 2(4), 107-108. (Tufts University, Medford, Mass.).

The course of adaptation to prism was examined by recording S's localization; a) an object which was objectively straight ahead; and b) straight ahead. It was found that, as the object of regard changed in apparent position and came to be localized correctly, straight ahead changed concomitantly with it. Mean data for 20 Ss with a 25 diopter prism showed that, of the total change in localization during adaptation to the prism, 71% resulted from a concomitant change in the test stimulus and straight ahead, while only 29% could be attributed to a reduction in the disparity between the test stimulus and straight ahead.

R 2

26,606

Kintsch, W. THE EFFECTS OF REPETITION ON THE SHORT-TERM MEMORY FUNCTION. Psychonomic Science, March 1965, 2(6), 149-150. (University of Missouri, Columbia, Mo.).

Lists of stimulus items were constructed in such a way that successive presentation of items were always separated by 1 intervening item for 1 group of items and by 10 intervening items for another group. The S's task was to decide whether he had seen each item before. The amount of forgetting which occurred between presentations was determined both for the short- and long-delay items as a function of the repetition of these items.

R 5

26,607

Siegel, M.H. THE SELECTION OF JUDGMENT CATEGORIES IN COLOR DISCRIMINATION. Psychonomic Science, March 1965, 2(6), 151-152. (USA Edgewood Arsenal Chemical Research & Development Labs., Edgewood Arsenal, Md.).

An experiment was performed to investigate the influence of some response categories upon Os' sensitivity to color differences. Inclusion of an "equal" category or requiring 2 criteria instead of 1 led to reduced sensitivity.

R 4

26,608

Foot, W.E. & Havens, L.L. STIMULUS FREQUENCY: DETERMINANT OF PERCEPTION OR RESPONSE? Psychonomic Science, March 1965, 2(6), 153-154. (Massachusetts Mental Health Center, Boston, Mass.).

2 stimulus variables, frequency of word usage and word configuration, were investigated tachistoscopically by a method designed to separate their effects on perception and verbal responding. Configurational differences appeared to alter perception. Differences in frequency of usage, however, were associated only with changes in response probability.

R 5

26,609

Smithe, W.M. VISUAL RECOGNITION: FACILITATION OF SEEING BY HEARING. Psychonomic Science, March 1965, 2(6), 157-158. (Dartmouth College, Hanover, N.H.).

A previous finding of enhanced visual recognition through vocalization by S is confirmed and extended by the present experiment which shows that similar effects on visual recognition occur when a voice other than S's is employed. It is concluded that such facilitation of visual recognition is the result of perceptual interaction, not kinesthetic or auditory feedback, as such, nor factors of expectancy and set.

R 1

26,610

Mandriota, F.J. VISUAL VELOCITY DISCRIMINATION: EFFECTS OF 'BLANKING' THE STIMULUS. Psychonomic Science, March 1965, 2(6), 159-160. (Princeton University, Princeton, N.J.).

Weber ratios were obtained for visual velocity discrimination under 2 stimulus conditions which differed only with regard to the presence of visible continuous motion. Discrimination of velocity under normal conditions was compared with discrimination under 'blanked' conditions. In the latter, Ss saw only the initial and final positions of a target separated in time by intervals comparable to the duration of the motions seen under the former condition. Difference thresholds for blanked motion are approximately double those for continuous motion over a wide range of velocities.

R 6

26,611

Morgan, B.B. & Alluisi, E.A. ON THE INFERRED INDEPENDENCE OF PAIRED WATCHKEEPERS. Psychonomic Science, March 1965, 2(6), 161-162. (University of Louisville, Louisville, Ky.).

24 Ss performed a visual watchkeeping task over a 30-min period. 8 of the Ss worked singly, and 16 worked as pairs of watch keepers. The proportion of signals detected in the paired-S condition (.906) was significantly greater than in the single-S condition (.735), but the estimated likelihood of an individual watchkeeper's detecting a signal was essentially identical in the 2 conditions (.693 & .735, for the 2- and 1-man systems, respectively). The results are interpreted as supporting the inference that the watchkeeping behaviors of paired Ss are operationally "independent".

R 5

26,612

Lindsay, P.H., Cuddy, Lola, L. & Tulving, E. ABSOLUTE JUDGMENTS OF SIMULTANEOUSLY PRESENTED VISUAL AND AUDITORY STIMULI. Psychonomic Science, April 1965, 2(8), 211-212. (University of Toronto, Toronto, Ontario, Canada).

4 Ss made judgments about unidimensional visual and auditory stimuli. Stimuli were judged under 2 levels of stimulus duration--50 msec. or 2 sec., and 2 conditions of presentation--stimuli presented singly from 1 modality or simultaneously from both modalities. For both stimulus duration, the amount of transmitted information per modality was less under conditions of simultaneous presentation. Results were discussed in relation to the problem of divisibility of attention.

R 3

26,613

Pitz, G.F. MAGNITUDE SCALES OF LINE LENGTHS. Psychonomic Science, April 1965, 2(8), 213-214. (Southern Illinois University, Carbondale, Ill.).

A comparison was made of magnitude estimation and magnitude production methods of scaling line lengths. Magnitude estimates gave functions with exponents significantly < 1, and which were affected by the size and presence or absence of the standard during judgment. Magnitude production scales were more regular in form, were not affected by attributes of the standard, and had slopes of approximately 1.

R 4

26,614

Hay, J.C., Pick, H.L., Jr. & Ikeda, Karren. VISUAL CAPTURE PRODUCED BY PRISM SPECTACLES. Psychonomic Science, April 1965, 2(8), 215-216. (Smith College, Northampton, Mass.).

A study of the immediate effects (rather than the after-effects) of viewing one's hand through a wedge prism. The "feel" of the hand is found to be pulled towards the displaced optical stimulus, and this effect is termed visual capture (after Tastevin). The effect of capture lingers after the eyes are covered, and this residue may be related to the after-effects hitherto studied.

R 6

26,615

Wallach, H. & Kravitz, J.H. THE MEASUREMENT OF THE CONSTANCY OF VISUAL DIRECTION AND OF ITS ADAPTATION. Psychonomic Science, April 1965, 2(8), 217-218. (Swarthmore College, Swarthmore, Penn.).

Our experiments were concerned with the fact that one perceives the visual field as stationary during head movements. It has been correctly argued that this is the result of a compensating process by which the head movement is taken into account, but its function has never been investigated beyond demonstrating that it is adaptable. We developed a technique for measuring the accuracy with which it operates. This technique made it possible to answer the question: What latitude of motion of a visual target during a head movement is compatible with its being perceived as stationary? It also enabled us to measure with precision partial adaptation to goggles that alter the relationship among visual directions, whereas previously only verbal reports of the visual field's apparent motion or rest have had to serve. Rapid adaptation to optical minification is reported.

R 1

26,616

Watson, C.S. & Mittler, B.T. TIME-INTENSITY EQUIVALENCE IN AUDITORY LATERALIZATION: A GRAPHICAL METHOD. Psychonomic Science, April 1965, 2(8), 219-220. (University of Texas, Austin, Tex.).

A graphical response was used to establish equivalent binaural time- and intensity-differences in auditory lateralization. For intensity differences < about 4.5 db a constant equivalence of approximately 60 msec. per db is found, for 500 cps tonal pulses. For larger intensity differences more time per db is required.

R 4

26,617

Johnson, T.J., Meinke, D.L., Van Mondfrans, A.P. & Finn, Judith. WORD FREQUENCY OF SYNONYM RESPONSES AS A FUNCTION OF WORD FREQUENCY OF THE STIMULUS AND LIST POSITION OF THE RESPONSES. Psychonomic Science, April 1965, 2(8), 235-236. (University of Wisconsin, Madison, Wisc.).

57 Ss wrote synonyms to stimulus words of high, moderate and low word frequency selected from the Lorge-Thorndike lists. High stimulus words tended to elicit synonym responses of higher word frequency than did moderate and low words. In addition, mean word frequency of the responses was shown to be a decreasing function of list position of the response.

R 6

26,618

Lachman, R. & Field, W.H. RECOGNITION AND RECALL OF VERBAL MATERIAL AS A FUNCTION OF DEGREE OF TRAINING. Psychonomic Science, April 1965, 2(8), 225-226. (State University of New York, Buffalo, N.Y.).

Since the 19th century, recognition has been accepted as more sensitive than recall in measuring retention. Considerable research supports this conviction which has influenced both pedagogy and experimental psychology. The research below demonstrates that recognition is superior to recall only at early stages of serial verbal learning. Previous demonstrations of the superiority of recognition are believed to be an artifact of multiple-choice tests which may reflect the elimination of incorrect alternatives rather than recognition of correct alternatives.

R 5

26,619

Tanner, T.A., Jr., Patton, R.M. & Atkinson, R.C. INTERMODALITY JUDGMENTS OF SIGNAL DURATION. Psychonomic Science, May 1965, 2(10), 271-272. (Ames Research Center, NASA, Moffett Field, Calif.).

Ss were asked to make both inter- and intramodal comparisons of the durations of lights and tones, in a 2-alternative, forced-choice situation, with signal durations between 0.5 sec and 1.6 sec. The probability of a correct judgment was higher for intra- than for intermodal comparisons and was highest for intra-auditory comparisons. For intermodal pairs of signals with durations 0.5 and 0.6 sec., there was a greater than chance probability of judging the visual signal longer than the auditory.

R 5

26,620

McLaughlin, S.C. & Bower, J.L. AUDITORY LOCALIZATION AND JUDGMENTS OF STRAIGHT AHEAD DURING ADAPTATION TO PRISM. Psychonomic Science, May 1965, 2(10), 283-284. (Tufts University, Medford, Mass.).

During adaptation to prismatic displacement, there are systematic changes in visual localization, in auditory localization, and in subjective straight ahead. The change in auditory localization is associated with the change in straight ahead rather than with the change in visual localization.

R 4

26,621

Winters, J.J., Jr. & Gerjuoy, Irma R. GAMMA MOVEMENT: FIELD BRIGHTNESS, SERIES, AND SIDE OF THE STANDARD. Psychonomic Science, May 1965, 2(10), 273-274. (Johnstone Training & Research Center, Bordentown, N.J.).

Gamma movement was investigated under 6 brightness levels. Comparison circles = to, and slightly smaller than, the standard were judged "larger" significantly more often than chance. Brightness level did not affect this phenomenon; the effect was more pronounced during the 1st series and when comparison figures were on the right.

R 9

26,622

Gaze, Lorna & Dodwell, P.C. THE ROLE OF INDUCED SET IN FIGURAL AFTER-EFFECTS. Psychonomic Science, May 1965, 2(10), 275-276. (Queen's University, Kingston, Ontario, Canada).

Naive Ss do not report figural after-effects (FAE) reliably. Many experiments on FAE have used Ss who were aware of the expected outcomes. It is demonstrated that pseudo-FAEs can be induced readily in naive Ss, with appropriate set-inducing instructions and the pseudo-effects can be obtained equally in the classically expected direction or in the opposite direction. Suggestible Ss tend to show greater pseudo-FAEs than non-suggestibles in some situations.

R 3

26,623

Dodwell, P.C. & Gaze, Lorna. THE ROLE OF EXPERIENCE WITHOUT SET IN FIGURAL AFTER-EFFECTS. Psychonomic Science, May 1965, 2(10), 277-278. (Queen's University, Kingston, Ontario, Canada).

It has been shown that reports of figural after-effects (FAEs) are very susceptible to the effects of an inducing set in otherwise experimentally naive Ss. Such Ss do not generally report FAEs in the absence of an induced set. This may be so either because FAEs are artifacts of set and not real perceptual after-effects, or because naive Ss lack practice in making fine visual discriminations and hence do not observe the small after-effects present in a display. It is demonstrated that in at least 1 situation the latter alternative is the more probable.

R 4



26,624

Seltzer, W.J. & Sheridan, C.J. EFFECTS OF INSPECTION FIGURE PERSISTENCE ON A FIGURAL AFTER-EFFECT. Psychonomic Science, May 1965, 2(10), 279-280. (University of Missouri, Columbia, Mo. & US Veterans Administration Hospital, Kansas City, Kan.).

4 experimental and 4 control Ss were presented monocularly with a large white circle on a black background (Inspection figure). Then Ss were asked to switch to the opposite eye and make relative size judgments of 2 smaller circles, = in size, 1 of which (the T-figure) was centered on the same point as the I-figure. For FAE control Ss the I-figure was removed during and subsequent to the brief period required to change to the opposite eye, whereas experimental Ss were treated identically except that the I-figure persisted in its former position during testing. Control Ss typically judged the T-figure to be smaller than the comparison figure, thus exhibiting reliable figural aftereffects. Experimental Ss typically judged the T-figure to be larger than the comparison figure, exhibiting a reliable reversal of FAE.

R 8

26,625

Brooks, R. SEARCH TIME AND COLOR CODING. Psychonomic Science, May 1965, 2(10), 281-282. New York University, New York, N.Y.).

In an attempt to determine the effect of color coding on search time, 6 groups of 10 Ss each were asked to respond to 10 different displays containing 60 symbols, some of which were color coded. Comparisons among conditions revealed that there was a significant difference in search times only between a "color" and a "no color" condition.

R 4

26,626

Nohara, Dixie M. VARIETY OF RESPONSES AND REACTIVE INHIBITION. Psychonomic Science, May 1965, 2(10), 301-302. (Northwestern University, Evanston, Ill.).

This experiment involved 4 lengths of intertrial interval (0, 5, 20, or 60 sec.) and 4 numbers of different letters (1, 3, 5, or 7) to be written over and over again during 10 1-min. trials. Increasing either the length of the interval or the number of different letters produced significantly higher performances (measured by the number of letters written per trial), but the predicted interaction was not significant.

R 1

26,627

Mintz, D.E. & Notterman, J.M. FORCE DIFFERENTIATION IN HUMAN SUBJECTS. Psychonomic Science, May 1965, 2(10), 289-290. (New York University City College, New York, N.Y. & University of Princeton, Princeton, N.J.).

Force of response was differentiated in 4 human Ss using a quantitative visual feedback procedure. Variations in the force required produced systematic changes in rate of response and in the precision with which the response was made.

R 2

26,628

Crowder, R.G. & Melton, A.W. THE RANSCHBURG PHENOMENON: FAILURES OF IMMEDIATE RECALL CORRELATED WITH REPETITION OF ELEMENTS WITHIN A STIMULUS. Psychonomic Science, May 1965, 2(10), 295-296. (University of Michigan, Ann Arbor, Mich.).

7-consonant stimuli were recalled immediately. When the consonant in Position 2 was repeated in Position 5, 6, or 7, an increase in errors occurred at the latter position, as compared with control stimuli involving no repetition. Confirmation of the Ranschburg Phenomenon does not occur, however, when the repeated-element positions are 2 and 4. Nor was there an increased error rate for elements following a repeated element. These observations support the importance of intra-stimulus interference in immediate memory, but leave uncertain the associative mechanism responsible for such interference.

R 5

26,629

Hartlage, L.C. KNOWLEDGE OF RESULTS AND CAUTIOUSNESS IN SIGNAL DETECTION. Psychonomic Science, June 1965, 2(12), 347-348. (Kentucky Department of Mental Health, Louisville, Ky.).

16 Ss were tested on the Rotter Level of Aspiration Board and classified as cautious or non-cautious. A tone masked by white noise was presented to Ss at their respective RL's on 30 of 60 trials, with 30 blank trials. Non-cautious Ss made significantly more false positive errors than did cautious Ss. With knowledge of results, both cautious and non-cautious Ss made fewer errors but non-cautious Ss still made significantly more errors than the cautious Ss.

R 7

26,630

Davidson, E.H. & Freeman, R.B., Jr. BRIGHTNESS CONSTANCY UNDER A GRADIENT OF ILLUMINATION. Psychonomic Science, June 1965, 2(12), 349-350. (Pennsylvania State University, University Park, Penn.).

10 undergraduates, 5 with and 5 without fixation, matched the brightness of 2 self-luminous disks at different positions on a reflecting background illuminated by an approximately linear gradient of illuminance. Judgments approaching brightness constancy were obtained even when the luminance of the test fields exceeded that of the background. The effect of the background was slightly, but not significantly, greater with fixation than without.

R 10

26,631

Pollack, R.H. EFFECTS OF FIGURE-GROUND CONTRAST AND CONTOUR ORIENTATION ON FIGURAL MASKING. Psychonomic Science, June 1965, 2(12), 369-370. (Institute of Juvenile Research, Chicago, Ill.).

Figural masking was investigated as a function of the amount of the contrast between concentric, successively-presented figures, and also as a function of the parallelism of the contours of the figures. It was found that masking occurred only when contrast was great and occurred to the greatest degree when contours of the inner and outer figures were parallel. Masking was inhibited by nonparallelism and by the presence of angles within the masked figure.

R 9

26,632

Eriksen, C.W. & Lappin, J.S. INTERNAL PERCEPTUAL SYSTEM NOISE AND REDUNDANCY IN SIMULTANEOUS INPUTS IN FORM IDENTIFICATION. *Psychonomic Science*, June 1965, 2(12), 351-352. (University of Illinois, Urbana, Ill.).

Identification accuracy of forms was studied as a function of the number of simultaneous occurrences of the form on different foveal locations. A model for computing perceptual independence was presented and the data suggest that at a given moment in time internal noise for different elements in the visual perceptual system, represented by different foveal locations, is uncorrelated.

R 4

26,633

Andreas, B.G. & Deutsch, Elizabeth. PROCESSES OF VERBAL MEMORIZATION REVEALED IN CORRECT AND ERRONEOUS RECALL OF WORDS AND PARALOGS. *Psychonomic Science*, June 1965, 2(12), 381-382. (University of Rochester, Rochester, N.Y.).

Paralog (C-V-C-V-C) distortions of real words were memorized in mixed lists no better than randomly generated paralog. Reversed words apparently were unrecognized by most Ss. Error patterns permit inferences concerning memory encoding processes.

R 3

26,634

Malcolm, D. & Lieberman, B. THE BEHAVIOR OF RESPONSIVE INDIVIDUALS PLAYING A TWO-PERSON, ZERO-SUM GAME REQUIRING THE USE OF MIXED STRATEGIES. *Psychonomic Science*, June 1965, 2(12), 373-374. (State University of New York, Stony Brook, N.Y. & University of Pittsburgh, Pittsburgh, Penn.).

9 pairs of Ss played 200 repetitions of a 2-person, zero-sum game requiring the use of mixed strategies. The group data indicated that the Ss did not conform to the prescription of the minimax model, but some individual Ss appeared to conform to the minimax prescription.

R 1

26,635

Hochberg, J. & Berko, M.J. "PHENOMENAL DISPLACEMENT" IN DELAYED AUDITORY FEEDBACK: I. DISPARATE INTER-AURAL INTENSITIES. *Psychonomic Science*, June 1965, 2(12), p389. (Cornell University, Ithaca, N.Y.).

College undergraduates were required to read standardized passages twice under a condition of delayed auditory feedback (DAF) in which the intensity of the fed-back input to each ear was equal, and once under DAF with highly disparate inter-aural intensities. Reading under the latter condition showed a highly significant reduction in the speech disruptive effect of DAF.

R 2

26,636

Fillenbaum, S. ADAPTATION WITH CONSTANT AND VARIABLE DELAY IN AUDITORY FEEDBACK. *Psychonomic Science*, July 1965, 3(2), 45-46. (University of North Carolina, Chapel Hill, N.C.).

The effects of an irregularly varying delay in auditory feedback (VDAF) were compared with those of a constant delay in feedback (DAF) with regard to: a) impairment in level of performance; b) adaptation in performance; and c) possible differences in rate of adaptation. Performance in a reading task was compared using a DAF interval of .20 sec and a VDAF interval varying irregularly from .10 to .28 sec. No difference was found between conditions in amount of impairment in performance. There was a significant improvement upon continued reading in both conditions, and there was no difference between conditions in the rate of improvement.

R 2

26,637

Hakes, D.T. STIMULUS ARTICULATION AND BACKWARD LEARNING. *Psychonomic Science*, July 1965, 3(2), 47-48. (University of Texas, Austin, Tex.).

An 8-pair PA list of low-meaningfulness paralog was learned to a criterion of 2 successive errorless trials by 2 groups of Ss, 1 of which articulated the stimuli while the other did not. All Ss then learned the same pairs in the backward direction for 16 trials, half of each group articulating the stimuli. Stimulus articulation had no effect on first-list learning. First-list articulation facilitated backward recall, the effect diminishing as backward learning progressed.

R 4

26,638

Conrad, R., Freeman, P.R. & Hull, A.J. ACOUSTIC FACTORS VERSUS LANGUAGE FACTORS IN SHORT-TERM MEMORY. *Psychonomic Science*, July 1965, 3(2), 57-58. (Applied Research Unit, MRC, Cambridge, England).

45 Ss recalled 6-consonant sequences immediately after letter by letter visual presentation. The main factor contributing to ease of recall was within-sequence acoustic confusability. Language habits were relatively unimportant. Single-letter language frequency was unrelated to recall; second order effects made a small but significant contribution.

R 10

26,639

Epstein, W. & Arlinsky, M. THE INTERACTION OF SYNTACTICAL STRUCTURE AND LEARNING INSTRUCTIONS. *Psychonomic Science*, July 1965, 3(2), 59-60. (University of Kansas, Lawrence, Kan.).

The interaction of syntactical structure and learning instructions was investigated. When the method of complete presentation was used the superiority of syntactical over unsyntactical material was greater for intentional as compared with incidental learners.

R 4

26,640

Mackworth, N.H. VISUAL NOISE CAUSES TUNNEL VISION. *Psychonomic Science*, July 1965, 3(2), 67-68. (Harvard University, Cambridge, Mass.).

Ss had quickly to detect similarities between 2 uppercase letters presented peripherally and 1 other central letter falling on the fovea. These 3 characters were so legible that this task was very easy when the 3 letters were flashed on by themselves. But the addition of extra letters to this display seriously impaired performance. The periphery of the retina could no longer accurately detect at a glance whether items were similar. Foveal performance was also affected to some extent by extra items in the periphery of the retina.

R 12

26,641

McLaughlin, S.C. & Bower, J.L. SELECTIVE INTERMANUAL TRANSFER OF ADAPTIVE EFFECTS DURING ADAPTATION TO PRISM. Psychonomic Science, July 1965, 3(2), 69-70. (Tufts University, Medford, Mass.).

Complete adaptation to prism has the appearance of a unitary phenomenon; but, at intermediate stages of adaptation, the total adaptive effect can be analyzed into 2 components which combine additively. 1 of these 2 components transfers 100% from adapted hand to unadapted hand, whereas the other does not transfer at all. It is concluded that 1 is a change in the apparent position of the visual stimulus while the other is a change in the felt position of the adapted hand.

R 4

26,642

Harrington, T.L. ADAPTATION OF HUMANS TO COLORED SPLIT-FIELD GLASSES. Psychonomic Science, July 1965, 3(2), 71-72. (University of Oregon, Eugene, Ore.).

"Split-field" glasses, consisting of a red filter before the left half-field of each eye and a green filter before the right half-field, were worn by 3 Os. The colors in the glasses did not seem to diminish in saturation as Kohler (1951) has reported, even after as long as 146 days. A very small change in perceived color could be noticed as the gaze was moved back and forth from right to left without the glasses on, but this may have an explanation at the ocular level.

R 1

26,643

Verrillo, R.T. THE EFFECT OF NUMBER OF PULSES ON VIBRO-TACTILE THRESHOLDS. Psychonomic Science, July 1965, 3(2), 73-74. (Syracuse University, Syracuse, N.Y.).

Absolute thresholds for vibration were determined as a function of pulse number and contactor area on human glabrous skin. The results indicate that if a sufficiently large contactor is used, the skin summates the energy over pulse number and over the contactor area. The results also support the hypothesis that cutaneous tissue may contain more than 1 type of mechanoreceptor.

R 5

26,644

Koestler, A. & Jenkins, J.J. INVERSION EFFECTS IN THE TACHISTOSCOPIC PERCEPTION OF NUMBER SEQUENCES. Psychonomic Science, July 1965, 3(2), 75-76. (Center for Advanced Study in Behavioral Sciences, Stanford University, Stanford, Calif.).

Experience suggests that a common error in processing visual sequences is inversion or transposition of 2 or more adjacent items. This phenomenon suggests that information concerning the identity of items and their positions may be partially separable. A perception experiment was performed with tachistoscopic exposure of 5, 6, & 7-digit sequences. Abundant evidence was found for transposition errors. Further, such errors were distributed in a serial position curve much like that found for errors of single items.

R 5

26,645

Schiller, P.H. & Smith, Marilyn C. A COMPARISON OF FORWARD AND BACKWARD MASKING. Psychonomic Science, July 1965, 3(2), 77-78. (Massachusetts Institute of Technology, Cambridge, Mass.).

Differences between forward and backward masking were studied by employing a disk, a ring and a pattern as masking stimuli and letters as test stimuli. The results show that interference is greater in forward than in backward masking. Interference was found to decrease monotonically with increasing interstimulus intervals (ISI) in all cases. Of the 3 masking stimuli, the ring produced the least interference and the pattern the most.

R 13

26,646

Mayzner, M.S., Blatt, M.H., Buchsbaum, W.H. & Friedel, R.T., et al. A U-SHAPED BACKWARD MASKING FUNCTION IN VISION: A PARTIAL REPLICATION OF THE WEISSTEIN AND HABER STUDY WITH TWO RING SIZES. Psychonomic Science, July 1965, 3(2), 79-80. (New York University, New York, N.Y.).

A partial replication of the visual masking study by Weisstein & Haber (1965) was performed incorporating the additional variable of masking ring size in order to investigate the discrepancy between findings of that study and the study by Eriksen & Collins (1964). Errors in discriminating the capital letters O & D in a forced-choice design were measured with 4 Ss when the exposure of either letter was accompanied or followed by either a masking ring of a stroke width equal to that of the letter or 5 times as large as the stroke width of the letter. The delays between the offset of the letter and the onset of the masking ring were concurrent, 0, 20, 40, 60, & 80 msec. Recognition was a u-shaped function of the delay for both ring sizes; however, the number of errors for the 2 ring sizes differed significantly, with the smaller ring having more overall errors. Therefore, the results approximated those of Weisstein & Haber, and indicated that masking ring size is an important variable in visual masking studies, although this variable alone did not produce the discrepancy that is found between Weisstein & Haber and Eriksen & Collins.

R 6

26,647

Barch, A.M. & Levine, J.R. STIMULUS FACTORS IN AUDITORY IDENTIFICATION LEARNING. Psychonomic Science, Aug. 1965, 3(4), 147-148. (Michigan State University, East Lansing, Mich.).

Paired-associate learning with Morse code signals as stimuli was facilitated as the amount of prior stimulus familiarization was increased. High interstimulus similarity of the auditory signals retarded paired-associate learning, especially during the initial trials. However, interstimulus similarity did not interact significantly with the effect of stimulus pretraining.

R 5

26,648

Mayzner, M.S. & Schoenberg, K.M. A FURTHER STUDY OF SHORT-TERM RETENTION AND PRESENTATION RATE. Psychonomic Science, Aug. 1965, 3(4), 159-160. (New York University, New York, N.Y.).

6 groups of 10 Ss each were tested in a 3x2x4 mixed analysis of variance design, in which the effects of 3 variables, namely, list length (10, 14, & 18 digits), number of cycles (single and multi-cycle), and presentation rate (4, 2, 1, & .5 sec per digit), on the short-term retention of a string of digits were examined. The results clearly showed that all 3 variables produced systematic effects on short-term retention and it was concluded that a trade off between number of cycles and presentation rate is possible, if total display time is held constant, thus supporting the previous work of Bugelski & Murdock in this area.

R 6

26,649

Hintzman, D.L. CLASSIFICATION AND AURAL CODING IN SHORT-TERM MEMORY. Psychonomic Science, Aug. 1965, 3(4), 161-162. (Stanford University, Stanford, Calif.).

Analysis of errors in a short-term memory task indicates that Ss adopted 2 possible coding strategies: digit vs letter categorization and subvocal or aural rehearsal. White noise had no effect on types of errors made or on over-all performance, but did bring out the usually covert rehearsal process. Evidence from errors and effects of noise point to a reinterpretation of "auditory" coding in terms of kinesthetic feedback produced by subvocal rehearsal.

R 2

26,650

Friel, C.M. & Derogatis, L. THE EFFECT OF NONPATTERNED SENSORY DEPRIVATION ON VISUAL RECOGNITION THRESHOLDS. Psychonomic Science, Aug. 1965, 3(4), 163-164. (Catholic University of America, Washington, D.C.).

A group of 18 college students underwent 50 min. of nonpatterned sensory deprivation after which they were asked to identify 4 letter nouns given them at various exposure times. It was found that this group could recognize significantly more words at a faster exposure time than could a similar group not exposed to deprivation. It was concluded that the period of deprivation worked to increase the perceptual acuity of the deprived group.

R 7

26,651

Wallach, H. & Kravitz, J.H. RAPID ADAPTATION IN THE CONSTANCY OF VISUAL DIRECTION WITH ACTIVE AND PASSIVE ROTATION. Psychonomic Science, Aug. 1965, 3(4), 165-166. (Swarthmore College, Swarthmore, Penn.).

Very rapid adaptation in the constancy of visual direction was obtained with an arrangement yielding displacements of the visual field during head movements by continuous exposure to the specific conditions that presumably cause the adaptation. Adaptation was obtained also when, in place of active head movements, S was turned back and forth on a rotating chair.

R 2

26,652

Heckenmueller, E.G. & Dember, W.N. A FORCED-CHOICE INDICATOR FOR USE WITH WERNER'S DISC-RING PATTERN IN STUDIES OF BACKWARD MASKING. Psychonomic Science, Aug. 1965, 3(4), 167-168. (University of Cincinnati, Cincinnati, Ohio).

A forced-choice method is described for use in backward-masking studies with Werner's disc-ring pattern. The efficacy of the method is verified in data from 40s. An interesting interactive effect on detection is reported between disc-duration and brightness.

R 5

26,653

Reinehr, R.C. THE RELATION BETWEEN SCORE ON THE STIMULUS VARIATION SCALE AND AUTOKINETIC MOVEMENT. Psychonomic Science, Aug. 1965, 3(4), 169-170. (University of Texas, Austin, Tex.).

Score on a self-report inventory designed to measure the amount of stimulation seeking activity characteristically engaged in by adults (SVS) was related to performance in the autokinetic situation. A significant positive relationship between SVS score and amount of perceived movement was found when a simple linear measure was treated as the dependent variable. When Voth's MI was treated as the dependent variable results were in the hypothesized direction but failed of significance.

R 8

26,654

Verrillo, R.T. VIBROTACTILE THRESHOLD AND PULSE POLARITY. Psychonomic Science, Aug. 1965, 3(4), p171. (Syracuse University, Syracuse, N.Y.).

Vibrotactile thresholds on human glabrous skin were determined for short monopolar pulses and for 2 directions of skin displacement. Positive and negative going pulses showed no threshold difference. No threshold difference was obtained when movement into the skin was compared to outward movement of the contactor. The threshold appears to be independent of the direction of displacement.

R 5

26,655

Dallett, K.M. "PRIMARY MEMORY": THE EFFECTS OF REDUNDANCY UPON DIGIT REPETITION. Psychonomic Science, Sept. 1965, 3(6), 237-238. (University of California, Los Angeles, Calif.).

Ss tried to repeat series of 8 digits immediately after hearing them. Each series of digits had a predictable digit (a zero) in a known location, and Ss were told to omit this digit. Performance in this task is similar to the performance obtained in repetition of 8 non-redundant digits, although if the redundant element is near the center of the series, Ss can improve their recall of the other digits. Digit recall seems to be largely, but not entirely, a matter of "primary memory", which involves a more or less faithful recoded replica of stimulus input.

R 5

26,656

LaBerge, D. & Winokur, S. SHORT-TERM MEMORY USING A VISUAL SHADOWING PROCEDURE. Psychonomic Science, Sept. 1965, 3(6), 239-240. (University of Minnesota, Minneapolis, Minn.).

Lists were constructed with digits serving as buffers and consonant items as targets, the targets being placed at various intervals from the end of the lists. All items were colored either red or black and Ss called out the color of the characters at a fast rate. At the end of each list Ss attempted to recall the consonant target item. Short-term memory functions were obtained which yielded a high recall rate at the zero retention interval and relatively low recall rate after a 6 sec retention interval.

R 5

26,657

Terman, M. IMPROVEMENT OF ABSOLUTE PITCH NAMING. Psychonomic Science, Sept. 1965, 3(6), 243-244. (Columbia University, New York, N.Y.).

Ss improved their accuracy in naming sine tones in an "absolute context" in which an intertrial distractive procedure was used to reduce "relative" cues. This result does not support the popular assumption that absolute pitch is an innate and inviolable "gift".

R 3

26,658

Lordahl, D.S., Kleinman, K.M., Levy, Barbara, Massoth, N.A., et al. DEFICITS IN RECOGNITION OF RANDOM SHAPES WITH CHANGED VISUAL FIELDS. Psychonomic Science, Sept. 1965, 3(6), 245-246. (Washington University, St. Louis, Mo.).

4 random shapes were presented twice to each of 96 Ss under monocular viewing. 2 shapes were presented to the left visual field and 2 to the right. In the test series, including control shapes, Ss experienced significant difficulty in recognizing those shapes which had been changed from 1 visual field to the other.

R 5

26,659

Winnick, Wilma A. & Binstock, Penny. THE EFFECT OF IRRELEVANT CONTEXT ON TACHISTOSCOPIC RECOGNITION. Psychonomic Science, Sept. 1965, 3(6), 247-248. (Queens College, City University of New York, Flushing, N.Y.).

It was hypothesized that the effect of irrelevant color cues on paired-associate learning might be generalizable to the tachistoscopic recognition situation. Words on colored backgrounds were learned by the free recall method to the criterion of 1 errorless trial. Half of these words on the same backgrounds and half on changed backgrounds were presented tachistoscopically along with unlearned control words on the colored backgrounds. Learned words on appropriate backgrounds had significantly lower thresholds than did those on inappropriate backgrounds; unlearned control words had significantly higher thresholds than did either of the types of learned words. Results were interpreted as supporting the hypothesis.

R 5

26,660

Streufert, S. & Driver, M.J. CONCEPTUAL STRUCTURE, INFORMATION LOAD AND PERCEPTUAL COMPLEXITY. Psychonomic Science, Sept. 1965, 3(6), 249-250. (Rutgers University, Brunswick, N.J. & Purdue University, Lafayette, Ind.).

A simulated decision making environment was used to test certain theoretical propositions of Schroder, Driver & Streufert (in press). It was shown that differentiation and integration in perception increases with increasing information load until a criterion of optimal perception is reached. Beyond this optimal point, differentiation and integration in perception decreases with further increasing information load. These findings may be represented as an inverted U shaped curve relating load and perception. Differences in the conceptual structure of Ss resulted in different levels of this inverted U curve. The results parallel a similar study of Streufert & Schroder (in press) concerned with differentiation and integration in performance.

R 9

26,661

Sekuler, R.W. & Bauer, J.A., Jr. DISCRIMINATION OF HEFTED WEIGHTS: EFFECT OF STIMULUS DURATION. Psychonomic Science, Sept. 1965, 3(6), 255-256. (Massachusetts Institute of Technology, Cambridge, Mass.).

In an experiment with hefted weights, Ss discriminated between 500 & 540 gm or between 500 & 560 gm. Each of these discriminations was studied with stimulus durations ranging from 100 to 1600 msec. Discriminability increases over the range 100 to 400 msec. and seems to have reached a plateau between 400 & 800 msec. An apparatus is described for controlling stimulus duration in psychophysical studies of weight discrimination.

R 4

26,662

Bernstein, I.H. & Reese, C. BEHAVIORAL HYPOTHESES AND CHOICE REACTION TIME. Psychonomic Science, Sept. 1965, 3(6), 259-260. (Arlington State College, Arlington, Tex.).

3 trained Ss participated in a choice reaction time task under conditions of 0, 1, 2, & 3-bits of stimulus uncertainty. Stimuli were presented in random sequence. Prior to each presentation Ss were required to state a behavioral hypothesis, i.e., guess which stimulus event would occur. The stimulus uncertainty-choice reaction time relationship was linear, confirming previous findings. However, when correct and incorrect behavioral hypothesis trials were separately analyzed, it was found that the positive linear relation was obtained only in the latter case; choice reaction time was independent of stimulus uncertainty when S's guess was correct.

R 9

26,663

Gould, J.D. & Schaffer, Amy. EYE-MOVEMENT PATTERNS DURING VISUAL INFORMATION PROCESSING. Psychonomic Science, Oct. 1965, 3(8), 317-318. (IBM Research Center, Yorktown Heights, N.Y.).

Eye-movement patterns were recorded while Ss visually scanned 5-cell patterns to compare the sum of the 3 digits in each of 4 peripheral cells with the sum of the 3 digits in the central "target" cell. Both larger target sums and greater target-non-target similarity caused significantly longer fixations; number and pattern of fixations were independent of experimental variables. Results supported predictions based upon previous studies correlating eye-movement patterns and visual stimuli.

R 5

26,664

Lockhead, G.R. REPETITION REDUNDANCY AND VISUAL FORM DISCRIMINATION. Psychonomic Science, Oct. 1965, 3(8), 319-320. (Duke University, Durham, N.C.).

An experiment by Eriksen & Lappin was partially replicated with the addition of a control condition. The results demonstrate that a theoretical model proposed by those authors is not correct and that simultaneously repeating a visual form in different areal portions of the retina leads to improved discrimination performance only when Ss are operating under position uncertainty, i.e., when they do not know where the stimulus will appear.

R 1

26,665

Sturr, J.F., Frumkes, T.E. & Veneruso, Donna M. SPATIAL DETERMINANTS OF VISUAL MASKING: EFFECTS OF MASK SIZE AND RETINAL POSITION. Psychonomic Science, Oct. 1965, 3(8), 327-328. (Syracuse University, Syracuse, N.Y.).

Visual masking was studied in 3 Os by measuring the threshold for detection of a small black disc (test target) with and without prior exposure to a concentric larger black disc (masking target). Independent variables were size of mask and retinal position. Results showed that: a) for all retinal positions, decreasing the size of the masking target produced a greater masking effect; b) for each size of mask, there was a greater masking effect in the periphery than in the fovea; c) in the fovea, the largest mask produced a lowered threshold for test target detection, suggesting summation or facilitation. These results were discussed in terms of contour interaction and signal-to-noise ratio.

R 6

26,666

Duda, P.D. & Zubek, J.P. AUDITORY SENSITIVITY AFTER PROLONGED VISUAL DEPRIVATION. Psychonomic Science, Oct. 1965, 3(8), 359-360. (University of Manitoba, Winnipeg, Manitoba, Canada).

Ss who were placed in darkness for a week but otherwise were exposed to a normal and varied sensory environment showed a significant increase in auditory flutter fusion frequency. This effect was still present 1 day after the termination of visual deprivation. The absolute threshold of hearing for 5 frequencies was not affected.

R 8

26,667

Sandusky, A. & Parducci, A. PLEASANTNESS OF ODORS AS A FUNCTION OF THE IMMEDIATE STIMULUS CONTEXT. Psychonomic Science, Oct. 1965, 3(8), 321-322. (University of California, Los Angeles, Calif.).

Absolute category judgments of the pleasantness of different odors were obtained from 138 Ss. Scale values were determined, separately for each S and by a Thurstone analysis of group data. These values provided the basis for manipulating the stimulus range. The variance of the judgments of a subset of the odors increased with restriction of the range. The data were interpreted as consistent with range-frequency theory but not with the theory of adaptation level.

R 6

26,668

Tresselt, M.E. UNI-POLAR OR BI-POLAR SCALES OF JUDGMENT. Psychonomic Science, Oct. 1965, 3(8), 365-366. (New York University, New York, N.Y.).

A study was made to try to determine whether Ss proceeded from rankings of 1-15 in an orderly fashion when asked to make preferential judgments of colors and types of music or whether there was a characteristic pattern to these rankings of 2 types of stimuli. 40 Ss were asked to rank from 1-15 arbitrary listing of 15 colors and of 15 types of music and also to indicate the order of the selections; i.e., was the carmine red judged as second most preferred but only after 5 other judgments had been made? The results show the same type of curve for both materials; both suggesting a discontinuity in the activity of judgment.

26,669

Williams, J.R. & Fish, D.L. EFFECT OF ITEM LENGTH AND NUMBER OF DIFFERENT ELEMENTS OF IMMEDIATE MEMORY. Psychonomic Science, Oct. 1965, 3(8), 353-354. (New York University, New York, N.Y.).

6 Ss were tested for immediate memory on number and symbol items under conditions representing all possible combinations of 2 through 9 item lengths and 2 through 9 different elements. The items (symbol or number) were presented sequentially on a memory drum (the symbols for 3 sec. and the numbers for 1.5 sec) and S recorded what he remembered immediately after the item disappeared from view. The results indicated that short-term retention decreases as the item length increases or as the number of different elements in the item increases.

R 7

26,670

Messick, D.M. THE UTILITY OF VARIABILITY IN PROBABILITY LEARNING. Psychonomic Science, Oct. 1965, 3(8), 355-356. (University of California, Santa Barbara, Calif.).

An experiment is reported which investigates the validity of Siegel's concept of the utility of variability. Human Ss predicted which of 2 types of stimuli would occur on each of 240 trials. Half of the 40 Ss had 2 responses (1 for each type of stimulus) while the other half had 10 (5 for each type). Within each of these groups, half the Ss saw 2 stimuli (1 of each type) and the other half saw 10 stimuli (5 of each type). Several predictions were made on the basis of Siegel's theory, but none were confirmed.

R 1

26,671

Binder, A., Wolin, B.R. & Terebinski, S.J. LEADERSHIP SELECTION WHEN UNCERTAINTY IS MINIMAL. Psychonomic Science, Oct. 1965, 3(8), 367-368. (New York University, New York, N.Y.).

Methods used previously to test a Markov model for leadership selection in small groups were applied to a special set of reinforcement conditions for the decisions of the leader. In earlier runs, members were reinforced on a partial schedule, but in the present experiment 1 member was reinforced with probability 1 for his decisions. Partly, it appeared, because of an experimental artifact, fit for predictions from the model were obtained for only 1 of 2 sets of Ss.

R 3

26,672

Kamlet, A.S. IDENTIFICATION OF SEQUENTIAL AUDITORY AND VISUAL STIMULI. Psychonomic Science, Nov. 1965, 3(10), 419-420. (University of Michigan, Ann Arbor, Mich.).

2 Ss identified pairs of 15 msec. 1-bit auditory and visual stimuli when the interval between the stimuli varied from 0 to 500 msec. The auditory judgments were better when the auditory and visual signals were separated by 500 msec. than when the 2 signals were presented simultaneously, and were also better when the auditory stimulus followed the visual stimulus than when the visual stimulus was delayed.

R 2

26,673

Mackworth, Jane F. DETERIORATION OF SIGNAL DETECTABILITY DURING A VIGILANCE TASK AS A FUNCTION OF BACKGROUND EVENT RATE. Psychonomic Science, Nov. 1965, 3(10), 421-422. (Defence Research Medical Labs., Toronto, Ontario, Canada).

In the course of a 30 min. session a significant decrease was found in detection and detectability ( $d'$ ) of a slightly brighter flash against a background flash rate of 200/min. No such decrement occurred when the background flash rate was 40/min. In both cases the signal rate was 6/min. This decline may be similar to the "blurring" effect discussed by Jerison, et al (1965). A similar effect was found earlier by the present author in a variety of tasks; this could represent an adaptation phenomenon. Intermittent periods of inattention also cause such performance deterioration as found in the classical vigilance task. Here it was felt the decrement was related to background rate rather than the ratio of signal to nonsignal events.

R 12

26,674

Murray, H.G. & Kohfeld, D.L. ROLE OF ADAPTATION LEVEL IN STIMULUS INTENSITY DYNAMISM. Psychonomic Science, Nov. 1965, 3(10), 439-440. (University of Illinois, Urbana, Ill.).

30 female college students were first adapted to either a 40 db tone, a 100 db tone, or to silence ( $N=10$ ), then given 48 reaction time (RT) trials with randomly ordered presentations of 40, 60, 80, & 100 db auditory signals. RT at all levels of signal intensity was fastest for Ss adapted at 40 db, slowest for Ss adapted at 100 db, and intermediate for Ss adapted to silence. These findings are predicted by Helson's adaptation-level theory but not by Hullian theory.

R 8

26,675

Sticht, T.G. & Sitterley, T.E. FREQUENCY AND LATENCY OF RESPONSE TO OFFSET-ONSET SEQUENCES OF CUTANEOUS STIMULATION. Psychonomic Science, Nov. 1965, 3(10), 425-426. (University of Louisville, Louisville, Ky. & University of Arizona, Tucson, Ariz.).

Beginning with a mechanically deforming stimulus resting on the skin, the duration of the temporal interval between the offset of the stimulus and the subsequent onset was varied from 45 to 140 msec. Response frequency and latency measurements were obtained for well trained Ss for each offset-onset sequence of stimulation. The results indicated that: a) response frequency drops to below threshold with durations below 75 msec.; and b) RT increases as the duration is decreased. The results are discussed in terms of the recovery movement of the skin following the removal of the stimulus.

R 8

26,676

Rock, I., Mack, A., Adams, L. & Hill, A.L. ADAPTATION TO CONTRADICTORY INFORMATION FROM VISION AND TOUCH. Psychonomic Science, Nov. 1965, 3(10), 435-436. (Yeshiva University, New York, N.Y.).

Is proprioceptive information the source of adaptation to optically distorted visual stimulation? In an experiment where the only information as to optical minification of size is given by touch, there is no change in the visual perception of size. Rather the judgment of size via touch undergoes a transformation.

R 2

26,677

Harcum, E.R. PRE-KNOWLEDGE OF ISOLATION AS A PREREQUISITE FOR THE ISOLATION-EFFECT. Psychonomic Science, Nov. 1965, 3(10), 443-444. (College of William & Mary, Williamsburg, Va.).

This study tests the hypothesis that prior knowledge of isolation is critical for an isolation-effect in perception. For some Os vertical lines were placed above and below the 7th of 10 elements in a tachistoscopic binary pattern. Other Os saw only patterns without such isolation, and a 3rd group of Os saw both isolated and unisolated patterns in random sequence. An isolation-effect was found only for Os who viewed isolated patterns exclusively. Only these Os knew before exposure that the 7th element would be isolated. The isolation-effect in pattern perception, as in serial learning, was attributed to the selective distribution of attention among stimulus-elements.

R 8

26,678

Hawkins, Nancy E. & Meyer, Merle E. TIME PERCEPTION OF SHORT INTERVALS DURING FINISHED, UNFINISHED AND EMPTY TASK SITUATIONS. Psychonomic Science, Nov. 1965, 3(10), 473-474. (Whitman College, Walla Walla, Wash.).

This investigation studied the effect of finished, unfinished and empty task situations in the perception of 3 short time intervals for men and women. The major results show that Ss tend to overestimate time when they are unoccupied and underestimate time when they are occupied. Significant differences occurred between the 3 short intervals of time, as well as, all interactions. No sex differences were found between the total responses, however, men estimated time better and women were influenced more by the tasks.

R 2

26,679

Schiffman, H.R. SIZE ESTIMATION AND THE SIZE OF THE MEASURING UNIT. Psychonomic Science, Nov. 1965, 3(10), 479-480. (Rutgers University, New Brunswick, N.J.).

Size estimates of line drawings made in terms of a familiar and 3 unfamiliar units of measure, presented as line segments, and another response condition: requiring the familiar units to be drawn from memory, were examined. The results were: a) in general, there was an underestimation using a relatively small, unfamiliar unit of measure, and an overestimation using all other units of measure; b) generally, the unit of measure enabling the most accurate estimates was the familiar unit; c) estimates using the familiar unit in 2 response conditions were not essentially different.

R 2

26,680

Muther, W.S. ERASURE OF PARTITIONING IN SHORT-TERM MEMORY. *Psychonomic Science*, Nov. 1965, 3(10), 429-430. (Stanford University, Stanford, Calif.).

The possibility of erasure or partitioning in short-term memory was studied by instructing Ss to retrieve by free recall only 10 relevant letters embedded in a sequence of 20 visually presented letters. In the precuing condition, irrelevant letters were indicated by a preceding blank, while in the post-cuing condition, irrelevant letters were indicated by a following blank. There was no difference in free recall under pre-cuing and post-cuing conditions, although free recall in both was better than chance. Free recall in a cueless control condition with irrelevant letters removed was better than in either pre- or post-cuing conditions. Analysis of errors suggests that irrelevant items were treated by partitioning or tagging in both cuing conditions, rather than by erasure, because cued-out letters occurred as errors of commission significantly more often than did letters which were not presented.

R 3

26,681

Heckenmueller, E.G. & Dember, W.N. PARADOXICAL BRIGHTENING OF A MASKED BLACK DISC. *Psychonomic Science*, Nov. 1965, 3(10), 457-458. (University of Cincinnati, Cincinnati, Ohio).

The paradoxical brightening of a black disc, retroactively masked by a black ring, is documented by data showing disc detection to be an interactive function of interstimulus interval (ISI) and instructions. The brightening effect, which occurs at an ISI of 25 msec., may be implicated in the frequently reported U-shaped masking function.

R 6

26,682

Alluisi, E.A. & Hall, T.J. EFFECTS OF A TRANSPHENOMENAL PARAMETER ON THE VISUAL PERCEPTION OF FORM. *Psychonomic Science*, Dec. 1965, 3(12), 543-544. (University of Louisville, Louisville, Ky. & Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.).

A transphenomenal parameter, based on the use of metric figures selected with a constrained sampling rule rather than a random rule, was found to increase response time significantly in a paper-and-pencil figure-cancellation task. Response time also increased with increasing figure complexity, but was unaffected by changes in the size of the figure. Comparison of these results with those of a prior study that differed only in terms of the choice situation presented suggests that perceptual performance may be affected by an interaction of task variables with the physical parameters of form.

R 4

26,683

McCall, R.B. ON THE INDEPENDENCE ASSUMPTION IN THE SPAN OF PERCEPTION. *Psychonomic Science*, Dec. 1965, 3(12), 545-546. (University of Illinois, Urbana, Ill.).

Using the customary methodology, the probability of detecting a dot was examined as a function of the number of dots contained in a circular array and the spatial dispersion of the dots. The independence hypothesis in the span of perception was shown to be limited and of tenuous validity since both hit rate (HR) and false alarm rate (FAR) were joint functions of the 2 independent variables.

R 9

26,684

Borkowski, J.G., Spreen, O. & Stutz, J.Z. EAR PREFERENCE AND ABSTRACTNESS IN DICHOTIC LISTENING. *Psychonomic Science*, Dec. 1965, 3(12), 547-548. (University of Iowa, Ames, Iowa).

Right ear preference in terms of percentage correct and number of ear orders was demonstrated in a dichotic listening context using noun pairs matched for initial phonemes. Ear order effects were markedly reduced as compared with previous results. The superiority of right over left ear was found in both immediate and delayed orders of reporting. Concrete words were reported more often than abstract words in both immediate and delayed channels. Parallel presentation (concrete and abstract words on separate channels) increased the probability of ear order effects.

R 11

26,685

Bower, T.G.R. VISUAL SELECTION: SCANNING VS FILTERING. *Psychonomic Science*, Dec. 1965, 3(12), 561-562. (Harvard University, Cambridge, Mass.).

Ss were required to report whether 2 successively presented lines of Os and Ds were same or different. In a pretest, failure to detect differences was a function of the position of the substitute letter, increasing with the distance of that letter from the left of the line. However, after training, it is the utility of a position, the probability of its containing a substitute letter, and not position per se, which determines accuracy. This result and the conditions of training which produced it, cast some doubt on theories which regard visual selection as a scanning process derived from overt eye-movements. A filter model seems more appropriate to the data.

R 3

26,686

Harcum, E.R. & Coppage, E.W. SERIAL LEARNING WITHOUT PRIMACY OR REGENCY EFFECTS. *Psychonomic Science*, Dec. 1965, 3(12), 571-572. (College of William & Mary, Williamsburg, Va.).

Data from learning by the anticipation method 10 homogeneous nonsense syllables, presented without an intertrial gap, show that temporal primacy and recency per se are not involved in the production of the classical serial-position curve of rote learning. Only negligible differences among item-positions appeared early in learning, when differential effects of proactive inhibition among the individual items should have been maximal, but a primacy effect did appear later. This primacy effect was attributed to S's strategy in selecting a syllable, differentiated on the basis of being temporally first, as a reference point around which the complete list was finally learned.

R 8

26,687

McCall, R.B. CAN SET INFLUENCE RETRIEVAL? *Psychonomic Science*, Dec. 1965, 3(12), 575-576. (University of Illinois, Urbana, Ill.).

An attempt was made to show that set could influence retrieval apart from original learning. The results suggested that if learning was not too distinctive, a set change to a list which S thought he could forget was disruptive to recall.

R 5



26,688

Livshits, N.N. (Ed.). EFFECTS OF IONIZING RADIATION AND OF DYNAMIC FACTORS ON THE FUNCTIONS OF THE CENTRAL NERVOUS SYSTEM - PROBLEMS OF SPACE PHYSIOLOGY. NASA TT F 354, Aug. 1965, 190pp. National Aeronautics & Space Administration, Washington, D.C. (Science Publishing House, Moscow, Russia). (Transl: Izdatel'stvo Nauka, Moscow, 1964).

The literature on combined effects of ionizing radiation and nonradiation factors on mammalian organisms is reviewed. The problem of the mechanism of organism response to combined factors is discussed. Published results of experimental investigations of combined effect of vibration and ionizing radiation on some animal organism functions are discussed. These studies are compared with literary data, and the mechanism of higher animal reactions to combined effect of vibration and ionizing radiations is considered. A suggestion is expressed that in responses to vibration and irradiation effects side by side with the mechanisms described in literature, parabiologic processes in the nervous system may be of great importance.

R 300

26,689

Wood, C.D., Graybiel, A. & Kennedy, R.S. A COMPARISON OF EFFECTIVENESS OF SOME ANTIMOTION SICKNESS DRUGS USING RECOMMENDED AND LARGER THAN RECOMMENDED DOSES AS TESTED IN THE SLOW ROTATION ROOM. Contract NASA Order R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 945, Rep. 121, Aug. 1965, 10pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

In a previous study the recommended doses of some antimotion sickness drugs were tested on the Slow Rotation Room (human centrifuge). 10 Ss were used. In the present study increased doses of these same drugs were used to investigate any possible increase in efficacy. Twice the dose of hyoscine (1.2 mg) failed to increase its effectiveness; however, when it was used in combination with d-amphetamine the total number of tolerated head movements exceeded the sum of that with these drugs when they were tested alone. A marked increase in effectiveness of d-amphetamine (20 mg) was noted over that in the earlier study in which a dose of 10 mg was used. Meclizine (Bonamine 150 mg), thiethylperazine (Torecan 30 mg), trimethobenzamide (Tigan 750 mg), and prochlorperazine (Compazine 15 mg) all were less effective than in the previous study when one third of these doses was used. The combination of hyoscine and d-amphetamine was the most effective drug, followed by hyoscine, d-amphetamine, and meclizine, in that order.

R 14

26,690

Stanley Aviation Corporation. A STUDY OF THE DYNAMIC MODEL TECHNIQUE IN THE ANALYSIS OF HUMAN TOLERANCE TO ACCELERATION. Contract NASr 37, NASA TN D 2645, March 1965, 229pp. National Aeronautics & Space Administration, Washington, D.C. (Stanley Aviation Corporation, Denver, Colo.).

A dynamic model analogous to the human body, consisting of a spring-mass system, is used in the analysis. When an acceleration is applied to the base of the spring, the response of the system is similar to the dynamic response of the human body under the influence of the same acceleration. If the input acceleration-time history is assumed to have a simple form, such as that represented by a step, rectangular or ramp function, the solution of the motion of the model in terms of the spring deflection and mass acceleration is relatively simple. The basic mathematics involved in obtaining this dynamic response is developed in the Appendices for a variety of simple input forms. The tolerance criterion adopted consists of setting a limit on the mass acceleration attained by the mass, so that the peak mass acceleration achieved under given input conditions is an important parameter. A linear, undamped, single degree of freedom system is used as the basic model, but the influence of damping and non-linearity of the spring on tolerance limits is also considered. The output of the model, in terms of the mass acceleration, depends on the input duration and damping, but can be as much as twice the value of the input acceleration. In the impact region, velocity change is an important criterion. A physical interpretation of the motion of the mass is given and the response characteristics of the system for step, rectangular, ramp, parabolic, and sinusoidal inputs are described. The model is used in a qualitative study of restraint and seat cushion effects, and for the case of an occupant in an escape capsule or seat. The influence of rate of onset on dynamic response is considered and the influence of rise time and spring frequency on tolerance levels is deduced.

R 3

26,691

Burriss, W.L. (Princ. Investigator). STUDY OF THE THERMAL PROCESSES FOR MAN-IN-SPACE. Contract NASw 1015, NASA CR 216, April 1965, 233pp. National Aeronautics & Space Administration, Washington, D.C. (AIResearch Manufacturing Company, Los Angeles, Calif.).

Thermal control of the human body is analyzed for the environments obtained in spacecraft shirtsleeve cabins and extravehicular pressure suits to provide environmental design criteria applicable to extraterrestrial missions. Basic heat and mass transfer correlations are used to establish dependence of the thermal processes and comfort criteria on atmospheric pressure and composition, gravity, ventilating velocity, gas temperature, humidity, and mean radiant temperature. The thermal and comfort criteria are analyzed for the lunar and zero-gravity shirtsleeve cabins. Extravehicular suit thermal control methods employing ventilation cooling, liquid-loop cooling, and radiation-cooling are analyzed to determine the relative performance, limitations, and problems associated with various methods of extravehicular suit thermal control. Extravehicular suit heat balances are performed for earth orbital, lunar orbital, Mars orbital, lunar plane, and lunar crater environments.

R 57

26,692

Kennedy, R.S., Tolhurst, G.C. & Graybiel, A. THE EFFECTS OF VISUAL DEPRIVATION ON ADAPTATION TO A ROTATING ENVIRONMENT. Contract NASA R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 918, Rep. 106, March 1965, 36pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

3 experiments were performed in the Slow Rotation Room to evaluate the influence of visual deprivation on several indices of adaptation to rotation. Data were obtained on tests of postural equilibrium, the Coriolis illusion, and canal sickness symptomatology. The findings of this report are presented below. Visual factors play a significant role in adapting to a rotating environment. The lack of visual information appears to minimize the symptomatology of vestibular sickness. In addition, performance during rotation, on tests of postural equilibrium, is at least as good and improvement is probably more rapid in an individual when visually deprived. Reduction in the magnitude of the Coriolis illusion as a function of time-under-rotation occurs whether vision is permitted or denied, but is more variable in the latter condition. In addition, the post-adaptation Coriolis illusion was absent following the no-vision rotation condition. It was evident, however, when visual information was available during rotation, and this might indicate the adaptation which occurred with vision was "deeper." Contiguous (4 days or less) duration exposures on the Slow Rotation Room show evidence that adaptation is more easily attained on the second exposure, thus indicating a transfer of training. Little, if any, transfer appears when exposures are 30 days apart.

R 55

26,693

Topmiller, D.A. & Sharp, E.D. EFFECTS OF VISUAL FIXATION AND UNCERTAINTY ON CONTROL PANEL LAYOUT. FINAL REPORT MAY 1963-DECEMBER 1964. Proj. 7184, Task 718402, AMRL TR 65 149, Oct. 1965, 28pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Seated Ss reached to and operated 12 toggle switch controls located 31, 41, and 51 inches above the floor and 0, 25, 50, and 75 degrees to the left of the mid-sagittal plane. The effects on reaction time, reach time, and total response time of 3 variables--control location, visual fixation/uncertainty, and anthropometric size of Ss--were investigated. Analyses of variance indicate that control location and visual fixation/uncertainty affect reaction, reach, and total response time; but body size does not. Derived scores were also analyzed to permit detailed examination of the perceptual-motor components of the response scores. The linear relationships between reach rate and reach distance observed in this study are compared with the curvilinear relationships reported in micromotion literature. To aid in evaluating control arrangements, response-time isograms are presented.

R 6

26,694

Kennedy, K.W. & Bates, C., Jr. DEVELOPMENT OF DESIGN STANDARDS FOR GROUND SUPPORT CONSOLES. FINAL REPORT. Proj. 7184, Tasks 718404 & 718408, AMRL TR 65 163, Dec. 1965, 53pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Experience gained in using a single standardized ground-support console configuration in the WS 131-B, Hound Dog, is discussed. Other ground console designs for possible standardization in future systems are described in detail. All designs are derived from a basic sit-stand configuration and will accommodate approximately 95% of the USAF male population and approximately 60% of the USAF female population. Each of the consoles can be made from 5 standard subassemblies. The suggested standard configurations permit engineering design freedom, yet restrict certain dimensional characteristics of the consoles to assure accommodation to the requirements and capabilities of the operator.

R 13

26,695

Carel, W.L. PICTORIAL DISPLAYS FOR FLIGHT. Contract NONR 4468(00), JANAIR Tech. Rep. 2732. 01/40, Dec. 1965, 207pp. Aerospace Group, Hughes Aircraft Company, Culver City, Calif. (AD 627669)

Pictorial displays for aircraft are discussed in this document under the following headings: a) derivation of pilot displays; b) vertical situation pictorial displays; c) horizontal situation pictorial displays; d) picture quality requirements; e) display devices; and f) sensing and data processing. (HEIAS)

R 52

26,697

Gee, D.L. & Humphreys, A.H. USER REVIEW OF CAMOUFLAGE FOR THE INDIVIDUAL COMBAT SOLDIER IN THE FIELD. APPENDIX C TO REPORT 1834. Task 1M624101D46701, Oct. 1965, 51pp. USA Engineer Research & Development Labs., Fort Belvoir, Va. (AD 478588)

This appendix to HEIAS 27,605 contains the graphical analyses of the user review results. (HEIAS)

26,698

Brand, D.H., Linhart, R.M. & Burns, C.A. INTEGRATED DATA COLLECTION, MONITORING, CONVERSION, AND ANALYSIS SYSTEM FOR PSYCHOPHYSIOLOGICAL STRESS RESEARCH. FINAL REPORT, 1 JULY 1961-31 DECEMBER 1963. Contract AF 33(657) 9810, Proj. 7222, Task 722201, AMRL TDR 64 64, June 1965, 98pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Research Laboratories, Inc., Dayton, Ohio).

The details involved in designing and executing a large-scale psychophysiological stress experiment are summarized. Design criteria and changes in experimental processes necessitated by preliminary, concurrent studies as well as instrumentation and data conversion problems are also presented. Emphasis is placed on description of the data processing routes, each of which consisted of analog tape forming, analog to digital conversion, data reduction and editing, and data analysis techniques. Flow diagrams, computer program writeups, and examples of pictorial output formats for general, automatic, biological data handling utility are appended.

R 7

26,699

Gee, D.L. & Humphreys, A.H. USER REVIEW OF CAMOUFLAGE FOR THE INDIVIDUAL COMBAT SOLDIER IN THE FIELD. APPENDIX B TO REPORT 1834. Task 1M624101D46701, Oct. 1965, 65pp. USA Engineer Research & Development Labs., Fort Belvoir, Va. (AD 478587)

This appendix to HEIAS 27,605 contains the recorded numerical data and comparative observations from the user review studies. (HEIAS)

26,700

Brestkin, M.P. (Ed.). THE EFFECT OF THE GAS MEDIUM AND PRESSURE ON BODY FUNCTIONS. III. NASA TT F 358, TT 65 50136, 1965, 290pp. Israel Program for Scientific Translations, Jerusalem, Israel. (Transl: (Russian) Izdatel'stvo "Nauka", 1964).

The third collection the "The Effect of the Gas Medium and Pressure on Body Functions" contains the results of further work-up of the problem of the effect on the body of increased and reduced total and partial pressures of various gases in ordinary air, as well as artificial gas mixtures used in deepwater descents. A characteristic feature of this collection is the major place accorded to investigations on problems associated with being under conditions of increased pressure. Specifically, the majority of articles in this collection contain material on the study of caisson disease phenomena, which are among the most dangerous consequences of increased pressure on the body and for many decades have interfered with man's exploration of the deep.

R many

26,701

Hercules, F. & Butler, R. ORBITAL TESTING REQUIREMENTS FOR GUIDANCE AND CONTROL DEVICES. VOLUME II. Contract NASw 1067, NASA CR 355, Dec. 1965, 363pp. National Aeronautics & Space Administration, Washington, D.C. (McDonnell Aircraft Corporation, St. Louis, Mo.).

This report is a second volume (HEIAS 26,790) on the topic of guidance and control technologies tested in orbit. It includes descriptions of experiments performed on a large number of devices, ranging from lubricants to gyros. (HEIAS)

R many

26,702

Goodman, M.W. & Workman, R.D. MINIMAL-RECOMPRESSION, OXYGEN-BREATHING APPROACH TO TREATMENT OF DECOMPRESSION SICKNESS IN DIVERS AND AVIATORS. BuShips Proj. SF 011 06 05, Task 11513 2, Res. Rep. 5 65, Nov. 1965, 40pp. USN Experimental Diving Unit, Washington, D.C. (AD 628823)

With growing awareness of the incremental frequency with which difficulties are encountered in recompression treatment of severely injured patients, and the grossly inadequate decompressions now characterizing the civilian diver casualty population applying to USN recompression facilities, evaluation and clinical trials of therapeutic procedures, alternative to USN treatment tables, were undertaken. These techniques are particularly suitable for recompression management of aviators' dysbarism when descent to sea level has not provided complete palliation. The proportion of good results obtained with initial recompression trials with these procedures has significantly exceeded that obtained in recent years, with the Diving Manual tables, although the current series of 79 cases surpassed comparable casualty groups in average case severity. Hypothetical and practical aspects of the treatment concept and technique are presented, and contraindications noted. There were no adverse responses to the 2.8 atmospheres absolute PO<sub>2</sub>, and 9 normal volunteer Ss showed no impairment of timed vital capacity following test exposures.

R 35

26,703

White, J.S., Callas, G.P. & Cicolani, L.S. APPLICATION OF STATISTICAL FILTER THEORY TO THE INTERPLANETARY NAVIGATION AND GUIDANCE PROBLEM. NASA TN D 2697, March 1965, 88pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

This paper presents the results of a study wherein the Kalman filtering technique is applied to Interplanetary Navigation and Guidance. The study considers the number, type, and timing of observations to be made, and the number and timing of velocity corrections. Both fixed time-of-arrival guidance and a periape-control guidance are considered. The results are presented principally in terms of uncertainty on arrival, miss on arrival, and magnitude of velocity increments required. It is shown that the observations can be restricted to sextant measurements of the target planet, the launch planet, and the moon (when in the vicinity of the earth), and that daily observations are desirable during the major portion of the flight, with a much more frequent observation schedule at each end. Four velocity corrections should be made which, with a periape-control guidance law, use a total of 30 m/sec velocity increment for each leg of the mission, resulting in a miss in the radius of periape of 4 to 5 km.

R 11

26,704

Roman, J., Henry, J.P. & Meehan, J.P. THE VALIDITY OF FLIGHT BLOOD PRESSURE DATA. Task 793003, SAM TR 65 27, May 1965, 14pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Aerospace Med., May 1965, 36(5), 436-441).

The validity of the acoustic (Korotkoff) method of blood pressure determination was checked on a pilot in the course of one mission in an NF-100-F jet fighter aircraft, by means of simultaneous arterial catheter data collection. Mean absolute error for both systolic and diastolic pressures was less than the mean respiratory variation in blood pressure for the 75 readings obtained.

R 11

26,705

Cooper, F.S. RESEARCH TECHNIQUES AND INSTRUMENTATION: EMG. Report from: "Proceedings of the Conference: Communicative Problems in Cleft Palate", April 1965, ASHA Rep. 1, 153-168. Haskins Laboratories, New York, N.Y. (Reprint)

Electromyography (EMG) is a technique especially suited to the analysis of skilled movements in general, and of speech in particular. Its particular merit is that it provides direct information about the speech gesture in its natural units. This paper consists of a brief account of the underlying phenomena and the means by which they can be observed instrumentally, examples of the use of electromyography in speech studies, and comments on the special opportunities and problems associated with the use of EMG for research on speech. The primary aim of the work at Haskins Laboratories has been to gain an understanding of the distinctive components of speech gestures and their relationships to the linguistic units of normal speech. Thus, the chief interest has been in gross aspects of the activity, primarily in the supraglottal region and at the larynx. The obvious need for electrodes on the tongue and inside the mouth, and the desirability of simultaneous recordings from several locations, led to the development of a system using small vacuum cups as electrodes.

R 20

26,706

Walk, D.E. & Sasaki, E.H. PROCEDURE TO ASSESS ENERGY EXPENDED DURING A SHORT-PERIOD TASK. FINAL REPORT MAY 1964-AUGUST 1964. Proj. 7184, Task 718405 & 718408, AMRL TR 65 205, Dec. 1965, 17pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A procedure was developed to measure the energy expended in a rowing task completed during a 12-second zero-G parabola. The technique was based on completed expired air samples. The S's expired air was collected under 3 conditions: a) 30 seconds of rest; b) 12 seconds of rowing; c) 15 seconds of recovery. The conditions were repeated 10 times, and the S's expired air was cumulated separately in 3 bags to obtain, in essence, a 5-minute collection for rest, a 2-minute collection for work, and a 2-1/2 minute collection for recovery. This procedure was replicated in 4 environments: laboratory, aircraft 1G level flights, aircraft 2G-1G-2G bank maneuvers, and aircraft 2G-0G-2G parabolic maneuvers. The results showed that the body reacted to a change in physical activity and returned to a state of equilibrium more quickly than previously reported in the literature. The volumes of expired air, oxygen, and carbon dioxide in each condition (rest, work, and recovery) were similar in the 4 environments, but the specific effects, if any, of the differential gravity levels were negligible and unsystematic.

R 10

26,707

Iberall, A.S. & Cardon, S.Z. FURTHER STUDY OF THE DYNAMIC SYSTEMS RESPONSE OF SOME INTERNAL HUMAN SYSTEMS. Contract NASw 1066, NASA CR 219, May 1965, 175pp. National Aeronautics & Space Administration, Washington, D.C. (General Technical Services, Incorporated, Yeadon, Penn.).

This report reviews what is known about temperature regulation, cardiovascular regulation, and hormonal regulation before discussing the dynamics of biological systems in general. The internal systems of the body are regarded as oscillators, having definite cyclic characteristics. Parallels are drawn between the behavioral system and the various biological systems (HEIAS)

R 66

26,708

Finley, F.R. & Wirta, R.W. A CORRELATIONAL STUDY OF MYOPOTENTIAL RESPONSE AND FORCE OF MUSCLE CONTRACTION DURING VARYING ACTIVITY DEMANDS. INTERIM REPORT. Contract Nonr 4252(00), Philco Rep. 2386, March 1965, 30pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Bio-Cybernetics Lab., Philco Corporation, Willow Grove, Penn.). (AD 613930)

The feasibility of utilizing electrical potentials on the surface of the skin for control functions was successfully demonstrated in the first ONR study. However, in the wake of this study, a critical issue remained which involved the reliability of the myoelectric pattern used for discriminating a control command for a discrete motion. Since the changing energy value of each signal source was the basis for identification of the control command, it became evident that it was important to study those factors or conditions which could alter the myoelectric pattern. The purpose of this investigation is to systematically study varying activity demands together with their coincident myopotential response, and to correlate these responses to the force of muscle contraction. The following are among the major conclusions of the study: a) the total of human performance cannot be electrically programmed and powered. Therefore, a systematic procedure which determines the specific function to be provided is necessary; b) while the data obtained indicate an increase in energy values with changes in mass, whether or not the spread of values would preclude their recognition as belonging to the same class of activity by the network of the functional device must await further study and analysis; c) Identification of the control motion and kinematic analysis of associated muscle action requires laboratory testing based on empirical knowledge. Implications of the above are presented and further problems are discussed.

R 7

26,709

Wing, J.F. A REVIEW OF THE EFFECTS OF HIGH AMBIENT TEMPERATURE ON MENTAL PERFORMANCE. FINAL REPORT, EARLY 1964-JANUARY 1965. Proj. 1710, Task 171002, AMRL TR 65 102, Sept. 1965, 32pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Fifteen experiments done in various laboratories have assessed the effects of high thermal stress on mental performance. Mental performance was measured by various tests in the different studies: mental addition, number checking, memory for words, problem-solving, telegraphy and coding tasks, and mental multiplication. These experiments represent different combinations of exposure time and effective temperature. Temperatures ranged from 87° to 114°. These studies were reviewed, and the upper thermal limit for unimpaired mental performance was found to vary systematically with exposure duration. Specifically, the lowest test temperatures yielding statistically-reliable decrements in mental performance decline exponentially as exposure durations are increased up to 4 hours. When this temperature-duration curve for mental performance is compared with physiological tolerance curves, it is found to lie well below them at every point in time. The upper limit for unimpaired mental performance should not be generalized to all stages of practice to all degrees of temperature acclimatization, to all types of tasks, or to all subject populations. The curve most adequately characterized the performance of artificial acclimatized military Ss on a highly stress-sensitive task either during their learning or else during their re-acquisition of skill on the task.

R 28

26,711

Umanskiy, S.P. G-SUITS AND PROTECTIVE HELMETS. Chapter IV from: THE ENDURANCE BARRIER OF PILOTS. JPRS: 20,380, TT: 65 31143, June 1965, 21pp. US Joint Publications Research Service, Washington, D.C. (Transl: Bar'yer Vynoslivosti Letchika, 1964, 97-120).

This chapter briefly describes the historical development of G-suits and protective helmets. The components and construction of the anti-gravity suit are illustrated and detailed; also, the altitude compensating suit with a tension device and anti-gravity suit chambers is described. Components and construction of various types of safety and pressure helmets are likewise discussed and illustrated. For both equipments, protection and endurance information is sighted.

26,712

Fregly, A.R., Bergstedt, M. & Graybiel, A. SOME RELATIONSHIPS BETWEEN BLOOD ALCOHOL POSITIONAL ALCOHOL NYSTAGMUS (PAN), AND POSTURAL EQUILIBRIUM (ATAXIA). Contract NASA Order R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 917, Rep. 105, March 1965, 12pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

Quantitative relationships were explored between blood alcohol levels, positional alcohol nystagmus (PAN), and postural equilibrium performances measured with a new quantitative ataxia test battery and with a series of clinical-type ataxia tests. Moderate amounts of 80-proof vodka (1 cc per lb body wt.; 55-100 mg% blood alcohol level) produced appreciable decrements in the postural equilibrium functioning of all 13 vestibular normal Ss evaluated. Maximum decrements occurred at 60-75 minutes following alcohol intake and were fairly well correlated with the peak blood alcohol levels. But more strikingly, the ataxic responses were in very close agreement with the intensity and duration of the PAN I (intoxication period) responses along the time axis. No systematic relationships between the ataxia test performances and PAN phase II responses were found; rather, the ataxic performances improved to virtually complete, if not complete, recovery during the PAN II period. Repetition of the experiment 2 days later with the same Ss under increased stimulation (100-proof vodka in the same dosage) reproduced the findings generally proportional to the increased stimulus.

R 9

26,713

Sells, S.B. & Sells, Helen F. (Eds.). BIOELECTRONICS ABSTRACTS. VOLUME 11-1962, 1963. 1965, 530pp. Texas University Press, Fort Worth, Tex. (Behavioral Research Institute, Texas Christian University, Fort Worth, Tex.).

Bioelectronics is a term that has recently enjoyed wide use to designate the application of electronic technology to the study of living tissue and the behavior of living organisms. Pressure from applied sciences, such as bioastronautics, for categorical measures of biological functioning, and of new developments in instrumentation have led to a tremendous expansion of research output and many discoveries of scientific value. This edition of the bioelectronics abstracts contains 4605 references, covering the 2-year period, 1962-1963. Of these, 3228 include abstracts. Most foreign-language references are cited by title and key words, but were not abstracted. Several references from 1961 are included to provide continuity with the previous edition, but foreign references have been cited only for 1962 and 1963.

R 4605

26,714

Martinek, H., Sadacca, R. & Burke, Laverne K. DEVELOPMENT OF A SELECTION BATTERY FOR ARMY IMAGE INTERPRETERS. DA Proj. R&D PJ 2J024701A723, Tech. Res. Rep. 1143, Oct. 1965, 43pp. USA Personnel Research Office, Support Systems Research Lab., OCRD, Washington, D.C. (AD 627539)

The present publication reports on concluding phases of research to identify among prospective image interpreter trainees those with the necessary aptitude and abilities to achieve competence as image interpreters. Experimental measures were administered to over 200 officers and 65 enlisted trainees at entrance into the Image Interpreter Training Course conducted at the Army Intelligence School. Tests were evaluated for effectiveness in measuring potential for image interpretation using 2 yardsticks of training success--final course grade and end-of-course performance on practical exercises simulating intelligence requirements for information extraction from aerial surveillance imagery. A 2-test battery consisting of an Image Orientation Tests and an Image Interpretation Information Tests was developed for Officer trainee selection. The Information test was made up of questions on general science, image interpretation, tactics, photography, and earth sciences. The General Technical Aptitude Area (GT), based on the Verbal and Arithmetic Reasoning tests of the Army Classification Battery, was the most effective selector for enlisted trainees.

R 4

26,715

Melching, W.H. MEASURES OF ABILITY AND PROGRAMED INSTRUCTION PERFORMANCE. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 65 12, Dec. 1965, 18pp. Human Resources Research Office, George Washington University, Alexandria, Va.

The objective of the present research was to examine the results of several programed instruction studies recently accomplished by the HumRRO Division at Fort Bliss, and to compare the several programs with regard to the extent of the relationship between measures of ability and programed instruction performance. 6 different programs had been used. The 5 matter of the programs consisted of direct current circuits, mathematics, magnetism and counterinsurgency. The number of frames in these programs varied from 99 to 3200. 168 Ss were used. An examination of the results of each study was undertaken to determine the extent to which consistent and meaningful results occurred across programs. Correlations were calculated between 3 measures of ability and 3 measures of performance on each program and achievement test. Despite the fact that the programs differed widely, each measure of ability tended to be related to each measure of program-test performance. How well a student performs on a program and on an achievement test appears to be closely related to the initial ability of the student. The contention, therefore, that programed instruction eliminates achievement differences due to intellectual ability was not substantiated.

R 8

26,716

Sorenson, R.C. OPTIMAL ALLOCATION OF ENLISTED MEN--FULL REGRESSION EQUATIONS VS. APTITUDE AREA SCORES. DA Proj. R&D PJ 2J024701A722, Tech. Res. Note 163, Nov. 1965, 26pp. USA Personnel Research Office, Statistical Research & Analysis Lab., OCRD, Washington, D.C. (AD 625224)

The Manpower Information and Computerized Systems Task utilizes the growing body of psychological, mathematical, and computer technology in seeking solutions to manpower management problems. The present Technical Research Note reports on continuing research directed toward increasing the efficiency of allocation through use of the Army Classification Battery (ACB) test scores. The research using a simulation technique evaluates the loss in performance efficiency attributable to the use of the 2 variable composites--Aptitude Areas--rather than the superior eleven variable regression estimate. It was found that in an optimal allocation procedure, performance of enlisted men could be substantially increased by using regression estimates from all ACB tests rather than the 2 test composites.

R 11

26,717

Galanter, E. (Princ. Investigator). ON THE NATURE OF LAWS IN PSYCHOLOGY. Contract NONR 477(34), PLR 16N, Nov. 1965, 20pp. University of Washington, Seattle, Wash.

Arguments are presented to support the point of view that psychological laws are most appropriately sought among response-response relations. Examples drawn from the psychology of learning, remembering, and perceiving are used to illustrate the argument.

R 6

26,718

Cliff, N. (Princ. Investigator). MULTIDIMENSIONAL SCALING AND COGNITION: I. RELATIONS AMONG JUDGEMENTS OBTAINED UNDER VARYING CONDITIONS. Contract Nonr 228 (32), Tech. Rep. 1, Nov. 1965, 38pp. Psychology Dept., University of Southern California, Los Angeles, Calif. (AD 628221)

This study was designed to see if the multidimensional scaling solutions for judgements of the same stimuli gathered using different directions and different orders of presenting the stimuli could be considered transformations of the same underlying structure and whether or not unidimensional judgements could be related to the same underlying space. 4 groups of S's judged the differentness of all possible pairs of 13 Lightfoot faces. The groups differed in the set given them in the directions and in the order in which the pairs were presented. 1 group received directions that emphasized the pleasantness of the emotions in their judgements, 1 viewed the stimuli in an order designed to emphasize the pleasantness distinction, the 3rd viewed the stimuli in an order designed to elicit non-Euclidean judgements. A 4th group served as a standard. All 4 groups judged the intensity of the 13 emotions as well as the differentness of the pairs. The multidimensional spaces derived for the 4 groups were found to differ only slightly but in some cases the differences appeared to be systematic. In all 4 groups the judgements of intensity of the emotions were closely related to the multidimensional spaces derived from the differentness judgements.

R 18

26,719

Singh, S. & Black, J.W. A STUDY OF NONSENSE SYLLABLES SPOKEN BY TWO LANGUAGE GROUPS IN VARYING CONDITIONS OF SIDETONE AND READING RATE. Language & Speech, Oct.-Dec. 1965, 8(4), 208-213. (Ranchi University, India & Ohio State University, Columbus, Ohio). (Reprint) (AD 633395)

28 experimental Ss, 14 English-speaking and 14 Hindu-speaking, were assigned to record an equal number of paired nonsense syllables under 2 conditions of 3 variables: a) delayed and normal sidetone; b) noisy and quiet conditions of listening; and c) fast and normal rates of speaking. The results show that the 2 language groups did not differ statistically significantly in the mean duration of the syllables nor in mean syllabic speech power. The duration of speech was universally lengthened under the condition of delayed sidetone, as compared to the normal. The duration was also longer under the condition of normal rate of reading as compared to the fast. Both delayed sidetone and noise in the earphones increased the mean syllabic speech power of the speakers. Presumably the noise reduced the talkers' awareness of the delayed sidetone. Although delayed sidetone increased the number of phonetic errors as compared to the normal sidetone for all, the 2 language groups differed significantly in scores that were derived from the phonetic transcriptions of recorded verbal material.

R 12

26,720

Payne, W.H. & Braunstein, D.N. SUITABILITY OF A SIMPLE TASK FOR THE STUDY OF TEAM TRAINING PROBLEMS. FINAL REPORT. Proj. 01703.02.08, Rep. SRM 65 5, June 1965, 10pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 466192)

4 teams of 4 Ss were given a signal detection task under 3 organizing conditions. Stimulus materials were rigidly controlled, and order of conditions was counterbalanced. No significant differences were found in number of signals detected. Experiments using similarly controlled stimulus materials, but involving more complex tasks and organizing conditions are suggested in order to study the effect of team organizing conditions on performance.

R 2

26,721

Larson, C.T. (Dir.). THE EFFECT OF WINDOWLESS CLASSROOMS ON ELEMENTARY SCHOOL CHILDREN. Nov. 1965, 111pp. Architectural Research Lab., University of Michigan, Ann Arbor, Mich.

This document presents the findings from an environmental case study; the investigation though aimed at finding out what happens when small school children are taught in windowless classrooms, was intended primarily to be a testing out of the proposed School Environments Research method of environmental evaluation. The main body of information was collected via teacher and pupil questionnaire surveys. Weaknesses in this technique were the amount of irrelevant information obtained and the influence of teacher biases in pupil replies. The removal of windows affected behavior indirectly; the variance in absence records of kindergarten children was different from the 3 older grades; concern for an outside view was also evident in pupil responses to changes in environmental factors; the effect on learning appeared to be small and dependent on the nature of the group, e.g. task-oriented, teacher practices; and the main positive finding--the shift in teacher attitude to preference for windowless classrooms. It was concluded that only viewing function keeps windows from becoming obsolete and that a new architectural approach is needed to the design of school fines-tation.

26,722

Elliott, T.K. EFFECT OF FORMAT AND DETAIL OF JOB PERFORMANCE AIDS IN PERFORMING SIMULATED TROUBLESHOOTING TASKS. FINAL REPORT NOVEMBER 1963-NOVEMBER 1964. Contract AF 33(615) 1137, Proj. 1710, Task 171004, AMRL TR 65 154, Nov. 1965, 46pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Applied Science Associates, Inc., Valencia, Penn.).

The effects of performance aid format, performance aid detail, and S aptitude on the performance of paper and pencil data flow analysis tasks were measured. 16 Ss were used in a 2 x 2 x 2 design. 8 of these Ss scored between the 75th and 95th percentiles on the electronic aptitude index of the Airman Qualifying Exam, the other 8, between the 40th and 60th percentiles. Each S received approximately 30 hours of training and practice, following which he was tested at one of the 2 levels of detail. Each S was tested for 9 hours with aids in the block diagram format and for 9 hours with aids in the list structure format. Order of testing was counterbalanced across Ss. Criterion measures were: a) number of problems attempted; b) percentage of errorless localizations; c) number of localization errors per problem; d) number of localization errors of exclusion per problem, and e) percentage of errorless isolations. S aptitude was found to have the greatest effect on the accuracy with which S performed both localization and isolation tasks. Level of detail had the greatest effect on their speed (low level of detail Ss solved nearly twice as many problems as high level of detail Ss.) Performance was better with the diagrams than with the list structures. The only exception to this superiority was found on errors of exclusion, and then only for Ss working at the higher level of detail.

R 2

26,723

Harsten, R.B., Silverman, D. & Gubin, S. COMMUNICATION REQUIREMENTS BETWEEN MANNED SPACECRAFT ON INTERPLANETARY VOYAGES. Report from: "AIAA Second Annual Meeting, San Francisco, California, July 26-29, 1965." AIAA Paper 65 324, July 1965, 7pp. Radio Corporation of America, Princeton, N.J.

To assure mission success, interplanetary flights will probably consist of 3-5 spacecraft, each carrying a crew of 3 astronauts. The communications requirements for such missions are similar to those of an airborne strike squadron. 2-way channels are necessary between squadron commander and spacecraft commanders as well as between the squadron and the home base. The operational capacity of each link should permit real-time television of commercial quality. This paper discusses the influence of mission and systems problems on the performance required of lasers and microwaves to satisfy the communications requirements. Wide-band laser communications between spacecraft should be feasible. For transmission to earth, neither lasers nor microwaves will be adequate until the problems of higher powered lasers and on-board offset lead angle computation are solved. (HEIAS)

R 10

26,724

Trow, W.H. & Smith, E.A. AN EXAMINATION OF THE FEASIBILITY OF MODULAR DESIGN FOR AUDIOVISUAL AUTOINSTRUCTIONAL EQUIPMENT. FINAL REPORT MAY 1963-MARCH 1964. Contract AF33(657) 11339, Proj. 1710, Task 171007, AMRL TR 65 79, May 1965, 26pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Graflex, Incorporated, Rochester, N.Y.).

The increasing need for audiovisual autoinstructional equipment in a wide range of applications has created a major problem in development of satisfactory equipment to meet the varying demands. Each specific situation requires a certain combination of optical, mechanical and electronic functions which cannot necessarily be adapted to subsequent usages of the equipment. This results either in the costly acquisition of many similar pieces of equipment or in undesirable restrictions on the instructional techniques that might be used. This study examines existing and potential areas of application for audiovisual autoinstructional equipment and proposes a modular approach in the development of new equipment. Each module would embody a separable major function and would be interchangeable in the system. The proposed basic modules would include: a) a slide-changer module; b) a filmstrip module; c) a family of screen modules; d) a family of light source modules; e) an audio record and playback module; f) 3 signal pulsing modules; g) a multiple-choice response module; and h) a write-in response module. Many of these would allow operational alternatives or modification for specialized applications for maximum versatility.

R 8

26,725

Joska, J.S. EFFECT OF AIRCRAFT SPEED ON LOW-ALTITUDE ACQUISITION OF GROUND TARGETS. FINAL REPORT, 16 JULY 1963-16 AUGUST 1963. Proj. 596722, APGC TR 65 34, Rep. PGT Doc. 63 1, May 1965, 37pp. USAF Air Proving Ground Center, Eglin AFB, Fla. (AD 461866)

This test was conducted to determine the effect of speed on target acquisition distance while flying tactical fighter aircraft at low altitude in a typical close support environment. A sample group of 11 pilots with a broad distribution of experience flew briefed mission profiles at 4 different speeds in an attempt to acquire similar ground targets from a selected altitude of 500 ft. Acquisition distance data were obtained from AN/MPS-19 radar plots. Using the criterion of speed versus target acquisition distance, results of the test indicated that speed appeared to have an effect on acquisition distance. Using the different criterion of speed vs the probability of acquiring the target, the statistical test demonstrated that speed appeared to have a significant effect on target acquisition probability for all the speeds flown. Further, the acquisition probability results demonstrated that speed appeared to have a significant effect when the speeds 250 & 350 KTAS were compared with 550 KTAS. Since these results were based on a minimum of data, additional tests are necessary before inductive conclusions can be formed relative to an overall population of pilots operating in the area of high-speed, low-altitude target acquisition.

26,726

Famiglietti, M.A. & Stephens, J.A. AN EXPERIMENTAL METHOD FOR DETERMINING THE FLIGHT PATH OF LOW-FLYING AIRCRAFT. Tech. Note 5 65, June 1965, 6pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

In human factors experiments related to Army airborne man-machine systems, data are often required that yield a low-flying aircraft's flight-path time history. This report describes an inexpensive method that simply requires 2 ground-based, synchronized motion-picture cameras. With this method, the aircraft's spatial coordinates are analytically determined as a function of time.

26,727

Kuchinka, A.J. PREDICTION OF OFF-RUNWAY TAKE-OFF AND LANDING PERFORMANCE. Report from: "AIAA Second Annual Meeting, San Francisco, California, July 26-29, 1965." AIAA Paper 65 328, July 1965, 18pp. Lockheed-Georgia Company, Lockheed Aircraft Corp., Marietta, Ga.

Theoretical equations are presented for the determination of static and dynamic soil forces against a pneumatic tire. The equations are applicable to any pneumatic tire, inflated to any reasonable pressure, that is being pulled or pushed across an arbitrary soil. The equations require that the soil properties  $k_c$ ,  $k_g$ , &  $n$  must be known. Particular application is made to the prediction of aircraft take-off and landing ground roll distances. Correlation of calculated vs measured distance is shown for both landing and take-off.

26,728

Eulberg, A.C. A TRANSLATION OF MANNED MILITARY MISSIONS INTO AN ENTRY VEHICLE CONCEPT. Report from: "AIAA Second Annual Meeting, San Francisco, California, July 26-29, 1965." AIAA Paper 65 488, July 1965, 25pp. General Dynamics/Convair, San Diego, Calif.

Potential military missions are surveyed and 3 types of missions are selected as the more probable to utilize manned entry. Earth reconnaissance, satellite inspection, and operational support for manned space stations are discussed in terms of possible tactical requirements. From this, vehicle performance requirements are arbitrarily rationalized in terms of crew and equipment size, orbital plane change, orbit altitude variation, and lateral range for quick return to the U.S. An examination of vehicle characteristics, such as  $L/D$ ,  $\Delta V$ , and relative weights for the performance requirements leads to the selection of 2 configurations for more detailed comparison, i.e., the USAF/AFFDL Conf. V high  $L/D$  and the NASA/LRC HL-10 medium  $L/D$  lifting body. A composite mission is assumed and the 2 vehicles are compared in terms of volume constraints, wing loading effects, landing and abort characteristics, and thermal protection systems, based on expendable tankage for the propulsive maneuvers. The resulting vehicles are compared on an empty and launch weight basis, with reference to the Titan IIIC and Saturn IB booster capabilities. The study conclusion is that the high  $L/D$  vehicle is more efficient on a weight basis for the particular mission requirements assumed.

R 24

26,729

Doppelt, F.F. A PROGRAM FOR THE SPATIAL DISORIENTATION DEMONSTRATOR. Task 775002, SAM TR 65 66, Oct. 1965, 9pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

Spatial disorientation was evaluated by a questionnaire given to a group of 55 rated pilots. This information was used to propose a program for the USAFSAM Spatial Disorientation Demonstrator.

R 5

26,730

White, K.C. & Tunnell, P.J. A GUIDANCE SCHEME FOR LUNAR DESCENT BASED ON LINEAR PERTURBATION THEORY. NASA TN D 3147, Dec. 1965, 38pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

A 3-dimensional guidance scheme for descending from lunar orbit to a hovering position was developed and analyzed. The scheme is based on the linear theory of perturbations about a nominal reference trajectory and uses thrust acceleration and thrust orientation angles as variables in the control equations. It allows the preselection of a lunar landing site from a wide range of initial conditions and permits guidance within the rigid constraints proposed for LEM. The specific control equations are fully developed in the report. Guidance capability, the effect on guidance capability of reducing the target size, and fuel consumption are considered in detail. An analog computer was used for the investigation and the basic results were checked by means of a digital computer program.

R 9

26,731

Sadoff, M. & Wempe, T.E. PILOT-VEHICLE SYSTEM SIMULATION FOR LOW-ALTITUDE, HIGH-SPEED FLIGHT. NASA TN D 2793, June 1965, 52pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

Based on a review of previous results pertinent to low-altitude, high-speed flight manual control problems, piloted simulator studies were formulated and carried out in certain areas where additional research appeared desirable. The vehicle simulated had variable wing sweep and was capable of supersonic speed at low altitude. The utility of the piloted simulator for examining and evaluating anticipated problem areas for the low altitude, supersonic speed penetration mission is indicated. Information is presented on handling qualities and stability augmentation system requirements, display and control requirements, and on the effects of cockpit acceleration environment (including an oscillatory component, assumed to approximate a predominant structural mode) on terrain-following task performance.

R 30

26,732

Reeder, J.P. THE IMPACT OF V/STOL AIRCRAFT ON INSTRUMENT WEATHER OPERATIONS. NASA TN D 2702, Feb. 1965, 15pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

In addition to the capability of V/STOL aircraft to operate from small unprepared fields, they have a potential for safely achieving "zero-zero" weather operation. They may also prove themselves economically by increasing the capacity of terminal airports through better use of available airspace, given their own instrument approach and landing facilities. To accomplish these goals the aircraft must be operated in partially converted configurations for several min. under instrument flight conditions. The state-of-the-art limitations imposed by handling qualities, pilot displays, and guidance systems dictate maximum instrument approach angles on the order of  $6^\circ$  and minimum speeds of about 45 knots for operational use. Instrument approach patterns are then determined by the time required for the pilot to establish himself on the approach courses, with the limitation that he handle the minimum number of variables at 1 time to stay within his capabilities, considering present instrument displays. Unfortunately, the minimum time required for such an instrument approach is about 5 min. which, for jet V/STOL, represents high fuel consumption and a prohibitive reduction in range and payload. Since the pilot can execute an approach and landing in perhaps 1 1/2 min. under visual conditions, it is apparent that the saving of about 3 1/2 min. of high-power approach time sets a goal for development of instrument displays and guidance systems. Otherwise, the jet V/STOL, at least, must perform the instrument approach as an airplane, observing higher than airplane weather minima, until visual contact with the landing area is established.

R 12



26,733

Middleton, D.B. SIMPLIFIED TECHNIQUE FOR ABORTING A LUNAR LANDING MISSION DURING POWERED DESCENT USING MANUAL BACKUP GUIDANCE. NASA TN D 2724, March 1965, 21pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

An analytical study has been made of a simplified technique for aborting the lunar-landing mission from along the powered-descent trajectory. The technique developed is feasible for use with the manual-backup guidance system of the landing spacecraft but could also be implemented with an automatic system. A circular chasing orbit at about a 50,000-ft altitude is used prior to a standardized transfer back to a command spacecraft parked in a circular orbit at 80 nautical mi. The emphasis of the study is on this return-transfer maneuver. An error analysis was made of a family of transfer orbits having pericynthions 50,000 ft above the M lunar surface. These orbits ranged from the minimum-energy Hohmann transfer to a synchronous-orbit transfer; rendezvous was normally achieved on the second intercept with the 80-nautical-mi orbit. Associated with the family of orbits is a "transfer window" of about 51 min. and a maximum incremental-velocity requirement of about 563 fps including midcourse correction. The transfer window was related to a range of elevation angles which the crew of the transferring spacecraft can measure optically or with radar; the transfer was initiated on the basis of this measured elevation angle. The results of the study indicate that the abort technique is feasible and that reasonable errors in altitude, altitude rate, and thrust angle do not significantly affect the "miss" distance at rendezvous.

R 4

26,734

Hall, A.W. & McGinley, D.J., Jr. FLIGHT INVESTIGATION OF STEEP INSTRUMENT APPROACH CAPABILITIES OF A T-33 AIRPLANE UNDER MANUAL CONTROL. NASA TN D 2775, April 1965, 13pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A flight investigation has been conducted to determine the steep instrument approach capabilities and limitations of a T-33 airplane under manual control. The study included an investigation of flare paths suitable for transition from the steep glide slope to touchdown. The maximum glide slope feasible for operational use in an instrument approach was 6°. This limit was established by the desired approach speed and the minimum engine speed that could be used. The minimum engine speed was chosen as the lowest speed which would still respond adequately if a wave-off occurred. More pilot effort was required to fly the 6° glide slopes than the 2.5° slopes. The greatest problem during the instrument approach and flare was the effort required to maintain proper lateral-directional control. Simulated autopilot lateral-directional control was found to be very effective in allowing more effort to be put on the glide-path control, which resulted in consistent touchdowns with the pilot under the hood. Flare paths which required about 25 to 30 sec. for transition from the 6° glide slope to the terminal angle were found to be satisfactory for manual control under instrument flight.

R 4

26,735

Stave, A.M. THE QUANTIFICATION OF HUMAN RELIABILITY. A FEASIBILITY DEMONSTRATION. Rep. TIS 65SD216, March 1965, 42pp. Valley Forge Space Technology Center, Missile & Space Div., General Electric, Philadelphia, Penn. (AD 614134)

The purpose of the study reported herein was to demonstrate a method of calculating the probability of human errors during prelaunch testing activities. Completion of the studies described in this report will permit statements of the following type: a) the probability that the test can be complete without human error; b) the probability that human errors will remain undiscovered; c) the probability that undiscovered errors will result in failures. In addition to a reliability number for the total test, such studies will provide a breakdown of reliabilities for all human tasks in the tests. With this breakdown, areas of greatest risk can be pinpointed and corrective efforts can be focused on them. Section 3 of this report describes a proposed method for calculating system reliability. Development and application of this technique will permit assessment of the contribution of each preflight test towards over-all system reliability. It will also point out the need for adding or removing tests from the testing cycle. This method takes into account: a) the probability that the hardware was manufactured correctly; b) the probability that the hardware will not be damaged by human handling; c) the probability that the tests administered to the hardware will reveal all malfunctions; and d) the inherent reliability of the hardware. Reliability determined by this scheme would be a function of the following formula:  $R = f(CI)$  where  $R$  = reliability,  $C$  = confidence,  $I$  = inherent reliability.

R 6

26,736

Primiano, F.P., Jr., Lowry, R.D. & Clarke, N.P. DISTORTION ANALYSIS OF THE ACCELERATION PRODUCED BY THE WESTERN GEAR CORPORATION MODEL 4010 HIGH AMPLITUDE VIBRATION MACHINE. FINAL REPORT JUNE 1964-SEPTEMBER 1964. Contract AF33(615) 1894, Proj. 7231, Task 723101, AMRL TR 65 27, April 1965, 28pp. USAF Biophysics Lab., Wright-Patterson AFB, Ohio. (Technology Incorporated, Dayton, Ohio).

The acceleration environment produced by the Western Gear Model 4010 High Amplitude Vibration Machine was surveyed at even fundamental frequencies from 2 to 20 cps at 2 levels of acceleration, 1 G & 2 G. The frequency components of the motion up to 50 cps were determined by a M-H 9050 Automatic Wave Analyzer and are presented in the form of harmonic distributions for each fundamental. The "total distortion figure" and "overall distortion figure" are used as measures of the fidelity with which the acceleration wave approximates a pure sine wave of the fundamental frequency. The data dictated that the 1 G acceleration was more distorted than the 2 G and that at both levels the distortion increased with frequency.

26,737

Tipton, C.L. HUMAN VS. FILTER AS DATA EXTRAPOLATOR IN A TWO-COORDINATE, SAMPLED-DATA TRACKING SYSTEM. Contract NRL Prob. Y02 01, Proj. RR 006 09 41 5351, NRL Rep. 6323, Oct. 1965, 11pp. USN Research Lab., Engineering Psychology Branch, ONR, Washington, D.C.

The performance of human operators was compared with that of a singly augmented filter in the continuous determination of the present position of a constant rate target moving in 2 coordinates. Target position was indicated intermittently in low, medium, or high noise levels and at low, medium, or high data rates. In addition, the target was subjected to a 10°, 20°, or 60° course change in each trial. The filter evidenced less average tracking error in 23 of the 27 combinations of conditions of data rate, noise level, and course change. In 12 of these instances the filter was significantly superior at  $p = .02$  level. Also, the results indicated increased error in human and filter performance as a function of increasing noise levels and decreasing data rates. Relative to the further enhancement of data extrapolation, several avenues of investigation recommend themselves. An immediate possibility is the employment of filter networks as an aid to the human operator. A second avenue of investigation is the study of more sophisticated filter designs. This experiment employed a filter of fixed time constant and fixed augmentation. An optimum filter would be of an "adaptive" type, automatically adjusting its time constant and augmentation as a function of noise and data rate.

R 3

26,738

Khlebnikov, G.F. & Lebedev, V.I. THE DYNAMICS OF EMOTIONAL-VOLITIONAL PROCESSES DURING PARACHUTE JUMPS BY ASTRONAUTS. FTD TT 65 437/1, S/O245 064 000 005, May 1965, 14pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Voprosy Psikhologii, 1964, 5, 3-10.). (AD 615534)

The cosmonauts in the course of their preliminary parachute jumping trainings were under constant observation. Before emplaning, in the plane and after landing the heart-rate was measured and the dynamometry of hands were carried out as well. The registration of changes of hands strength and those of the heart-rate disclose the dynamics of the emotional "tuning" of cosmonauts to the coming parachute jump. On the first day of parachute jumping the emotional reactions were significant and were markedly different from emotional reactions of well-trained parachutists. But the reactions became more adequate and due to the training of volitive processes the emotional manifestation at the repeated parachute jump got weak. The emotional reaction to danger is characterized by the "sthenic" excitation which is evoked by the activation of the conscious regulation of behavior. All cosmonauts had the most stable positive emotions at the second stage of parachute jumping training (jumping onto the water, during nights, in the diving dresses). The data obtained established that the positive volitive qualities in cosmonauts in the course of parachute jumping training were worked out. These volitive qualities favored the further successful performance of cosmic flights.

R 17

26,739

Hartman, B.O. & Langdon, D.E. A SECOND STUDY ON PERFORMANCE UPON SUDDEN AWAKENING. Task 775504, SAM TR 65 61, Aug. 1965, 10pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

5 Ss served for 5 successive nights in an experiment on performance upon sudden awakening. 2 performed on a systems (procedural) task and 3 on a flying task. Awakening performance was always poorer than presleep performance. Performance on the systems task showed a systemic recovery during the 10-min. trial after awakening, but not on the flying task. The findings agree well with an earlier study.

R 2

26,740

Jonsson, C-O., Sjöberg, L. & Vallbo, S. STUDIES IN THE PSYCHOLOGICAL EFFECTS OF A NEW DRUG (DIETHYLPROPION). II. SUBJECTIVE EFFECTS IN THE NATURAL MILIEU. Number 181, Jan. 1965, 9pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

2 doses of diethylpropion, one dose pipradrol, one dose amobarbital and placebo were administered to 116 Ss, predominantly females. The Ss rated their subjective state after 2 hours on 20 variables. The variables were intercorrelated under pipradrol and amobarbital, respectively, and the correlation matrices were subjected to factor analysis. 4 factors were found in both studies: Happiness, Alertness, Relaxation, and Flight of thoughts. There is some agreement between the 2 factor analyses. There were few significant effects of the drugs on factor scores, but the structure is quite unambiguous: pipradrol and diethylpropion are both stimulating while amobarbital is tranquilizing.

R 4

26,741

Frankenhaeuser, Marianne & Post, Birgitta. OBJECTIVE AND SUBJECTIVE PERFORMANCE AS INFLUENCED BY DRUG-INDUCED VARIATIONS IN ACTIVATION LEVEL. Number 184, Feb. 1965, 18pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

Performance was measured by 7 sensorimotor and perceptual tests given to 30 students in 6 successive trials, spread over 5 hours, before and after the intake of either 15 mg dexamphetamine, 200 mg Pentobarbitone, or a placebo. Measures of subjective performance, level of aspiration, wakefulness and mood were obtained by the method of magnitude estimation. At the present dose-levels both objective and subjective effects appeared earlier, lasted longer and were more intense after dexamphetamine. A close agreement was found between the amount of objective and subjective improvement following dexamphetamine, whereas the objective impairment induced by Pentobarbitone was not reflected in the subjective measures. These results are examined in relation to the other indices of activation.

R 17

26,742

Frankenhaeuser, Marianne, Fröberg, Jan, Goldberg, L. & Myrsten, Anna-Lisa. EFFECTS OF ALCOHOL AS MODIFIED BY TRANQUILIZING DRUGS. Number 199, Nov. 1965, 9pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

Effects of 0.55 g alcohol per kg body weight when given together with either a placebo, 800 mg meprobamate, or 20 mg chlordiazepoxide, were examined in 8 normal Ss. a) After meprobamate performance was more impaired and subjective intoxication more pronounced than in the alcohol + placebo condition. b) After chlordiazepoxide performance was, on the whole, less impaired than after alcohol + meprobamate, and the subjective reactions were less pronounced than in both other alcohol conditions.

R 17

26,743

Jonsson, C-O., Sjöberg, L. & Vallbo, S. TRIOXAZINE AND MEPROBAMATE. I: OBJECTIVE TEST DATA. Number 192, June 1965, 10pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

The effects of trioxazine and meprobamate in 1200 mg & 1600 mg doses have been compared with each other and with placebo in a triple blind study with 8 variables. The Ss were 12 healthy young males. In CFF both drugs have similar effects at the lower dose level. The effects are increased at the higher level and the effects of meprobamate exceed those of trioxazine at that level. In Apparent motion only 1600 mg meprobamate has a definite sedative effect.

R 24

26,744

Sjöberg, L., Jonsson, C-O. & Vallbo, S. TRIOXAZINE AND MEPROBAMATE. II: RATINGS OF SUBJECTIVE EFFECTS. Number 193, June 1965, 13pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

2 drugs at 1200 & 1600 mg. and placebo were compared in 30 variables denoting various subjective phenomena. The whole set of data was factor analyzed and 7 factors were retained for rotation (varimax). 6 of the rotated factors could be interpreted. The factors were subjective working capacity, hunger and thirst, fear reduction, tiredness, euphoria, and irritation. Factor scores were estimated through simple summation procedures and drug effects on factor scores were studied. Both drugs lowered subjective working capacity and increased tiredness, trioxazine even at the lower dose.

R 8

26,745

Topmiller, D.A. APPLICATION OF BEHAVIORAL SCIENCE TO PERFORMANCE AID DEVELOPMENT. Proj. 7184, Task 718406, AMRL TR 65 146, Aug. 1965, 13pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

4 classes of variables relevant to behavioral research on the development of performance aids (technical orders, maintenance manuals, etc.) are outlined: a) Legibility and Format Variables; b) Variables Associated with Processing Printed Numeric Information; c) Variables Associated with the Physical Configuration of Performance Aids; and, d) Variables Associated with Troubleshooting Informational Processing and Display Systems. Each of these topics is discussed within a historical framework, with supporting empirical research. Some predictions are made for future trends in performance-aid behavioral studies.

R 13

26,746

Payne, P.R. PERSONNEL RESTRAINT AND SUPPORT SYSTEM DYNAMICS. FINAL REPORT JULY 1962-DECEMBER 1963. Contract AF 33(657) 9514, Proj. 6301, Task 630102, AMRL TR 65 127, Oct. 1965, 89pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Frost Engineering Development Corporation, Englewood, Calif.).

Like any other complex dynamic system the human body responds in a complex way to acceleration inputs which vary rapidly with time. The need to avoid stresses large enough to cause injury to the body usually imposes limits on the permissible input acceleration. The restraint system interposed between a vehicle and its occupant can modify the physiological effects of a vehicle's acceleration--time history. This modification should be made as favorable as possible by minimizing the stresses generated in the vehicle's occupant. To determine optimum dynamic characteristics for the restraint system, its important characteristics, and those of the human body, need to be represented in terms of a mathematical or "dynamic" model. Through suitable analysis, either mathematical or by means of a computer, those dynamic characteristics of the restraint system can be determined which will minimize the peak stresses developed in its human occupant. In this report a general theory of suitable dynamic models is developed for this type of problem. Closed form solutions for a number of simple cases are presented also. In addition a method is shown which permits development of simple dynamic models for the human body utilizing existing experimental data.

R 13

26,747

Wasicko, R.J. & Magdaleno, R.E. EFFECTS OF NONLINEARITIES ON HUMAN OPERATOR TRACKING PERFORMANCE: A REVIEW OF THE LITERATURE. FINAL REPORT SEPTEMBER 1964-MAY 1965. Contract AF 33(615) 1782, Proj. 7184, Task 718402, AMRL TR 65 158, Oct. 1965, 40pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Technology, Inc., Hawthorne, Calif.).

Available literature on the effects of system nonlinearities on human operator tracking performance is summarized. The reviewed reports include experimental investigations in the technical areas of human engineering and aircraft handling qualities. Pertinent information is presented on experimental details, types of nonlinearities and other experimental variables tested, and primary results, and it is concluded that the general state of knowledge in this area is unsatisfactory. Several nonlinearities (such as actuator rate limiting) important in aircraft manual control systems have not been experimentally investigated, and there is inadequate data on the influence of forcing function characteristics.

R 21

26,748

Hornseth, J.P. MANUAL CONTROL OF A PULSE-FREQUENCY MODULATED REACTION CONTROL. FINAL REPORT. Proj. 7183, Task 718301, AMRL TR 65 145, Aug. 1965, 11pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A manual pulse-frequency modulated reaction control is a control with fixed pulse width, fixed pulse amplitude, and manual control of pulse frequency. For such a control, it is possible to maintain a constant reactive force per pulse (i.e., fixed control output gain) for various combinations of pulse widths and pulse amplitudes. The controlled element for this study was a one-dimensional second order system. A semirandom sequence of 3 step voltages was used to displace a spot on a CRT. Ss were required to recenter the spot as fast as possible. Manual control performance was tested under 3 levels (low, middle, high) of control output gain. 3 pulse width-pulse amplitude combinations were tested at the low and high control output gain levels and 4 pulse width-pulse amplitude combinations for the middle control output gain level. 3 Ss were tested under all conditions. Performance measures obtained were: integrated absolute error, integrated absolute fuel consumption, and integrated absolute stick motion. The results of this study indicate that a) changing pulse width and pulse amplitude, but keeping control output gain fixed, does not affect manual performance; but that b) changing control gain does.

R 4

26,749

Tieber, J.A. & Lindemuth, R.W. AN ANALYSIS OF THE INERTIAL PROPERTIES AND PERFORMANCE OF THE ASTRONAUT MANEUVERING SYSTEM. FINAL REPORT OCTOBER 1964-AUGUST 1965. Proj. 7184, Task 718405, AMRL TR 65 216 & AF Institute of Technology GA/PH/65 4, Dec. 1965, 234pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (USAF Institute of Technology, Wright-Patterson AFB, Ohio).

The inertial properties and performance parameters of an Astronaut Maneuvering System are determined by mathematical modeling. The inertial properties of an astronaut in a space suit are determined by modification of an existing mathematical model of the human body to include a mathematical model of a space suit. The space suit model is based on measurements of suited Ss and suit weight regression equations. The inertial properties determined are: a) location of the system center of mass; b) moments and products of inertia about axes through the center of mass; c) the principal moments of inertia; and d) the orientation of the principal axes. These properties are used in a computer program developed to analyze the performance of the AMS by simulating the operation of the MMU in the system. Performance parameters determined are: linear and angular acceleration, velocity, and displacement, and fuel consumption. Maneuver and propulsion efficiency factors are defined and calculated. The efficiency factors indicate loss of system efficiency due to inertial cross-coupling, misalignment of center of mass and thrust line, and intermittent thruster operation. The efficiency factors are used to compare system performance during various maneuvers.

R 25

26,750

Shelanski, M.V. CUTANEOUS TOXICITY EVALUATION OF AIR FORCE DEVELOPMENT MATERIALS. VIII. FINAL REPORT JUNE 1965-OCTOBER 1965. Contract AF 33(615) 1571, Proj. 6302, Task 630201, AMRL TR 65 208, Dec. 1965, 5pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Industrial Biology Research & Testing Laboratory, Inc., Philadelphia, Penn.).

4 Air Force development materials were studied via the prophetic patch test method on laboratory animals to determine the primary irritant effect, gross sensitization index, and gross percutaneous toxicity of these materials. The patch test studies with rabbits indicated that one of the materials produced severe primary irritant action. The 3 remaining materials, namely, spray disinfectant, Para nitrophenol, reagent grade, and Para nitrophenol, technical grade produced no significant reactions on 300 human volunteers. The Shelanski repeated insult patch test was used. This test, in addition to giving information about primary irritation and sensitization characteristics of the compound, will also bring out any fatiguing reactions which may occur on continuous contact of the material with the human skin. It was concluded that these materials may be considered innocuous and may be permitted to contact human skin for prolonged periods. However, it was also pointed out that the patch test situation does not duplicate the range of temperature, humidity, air flow, perspiration, and friction, among other factors, which will be met in actual usage of the material.

R 4

26,751

Sergeyev, A.A. ESSAYS ON THE HISTORY OF AVIATION MEDICINE. NASA TT F 176, April 1965, 413pp. National Aeronautics & Space Administration, Washington, D.C. (USSR Academy of Sciences Publishing House, Moscow, Russia).

Essays on the history of aviation medicine covers the period between the inception of the first views on the nature of the effect of reduced atmospheric pressure and the end of the Second World War. The essays deal almost exclusively with aspects of the development of Soviet aviation medicine; the state of aviation medicine outside the USSR is dealt with only in part and the information given applies to the period up to 1930. In this form aviation medicine outside the USSR is presented merely as a background reflecting the specific developmental features of Soviet aviation medicine. An extensive bibliography of works in Russian on aviation medicine up to 1950 is appended.

26,752

Sergeyev, Ye. & Alekseyev, V. THE COSMONAUT STEPS OUT OF THE SPACESHIP. JPRS 30,865, TT 65 31384, June 1965, 9pp. US Joint Publications Research Service, Washington, D.C. (Transl: Nauka i Zhizn', April 1965, 4, 14-18.).

This article, written before the historical Voskhod-2 flight when man first stepped into space, discusses in general the problems to be encountered in future space exploration: orbital stations and the effects on the inhabitants of prolonged weightlessness, assemblage of ships in orbit and protection of man from the effects of the outer atmosphere and spatial orientation inside the space ship and in open space--the use of magnetic shoes, motors and other aids to maintaining positions and executing movements. (HEIAS)

26,753

Schaefer, H.J. RADIATION EXPOSURE IN SOLAR PARTICLE BEAMS BEHIND VERY LOW SHIELDING. Contract NASA R 75, Proj. BuMed MR005.13 1002, Subtask 1, Repts. NSAM 914 & 31, Feb. 1965, 12pp. USN School of Aviation Medicine, Pensacola, Fla.

Outside the vehicle the astronaut is protected from radiation merely by his space suit with a shielding equivalent of about 0.1 g/cm<sup>2</sup>. Evaluations based on a spectral model for a solar particle beam suggested by Weir and Brown show that the skin dose for such low shielding is due predominantly to the alpha component of the flare beam. 65% of this alpha skin dose is produced at a high LET corresponding to a QF of 6 and an RBE of 3. The alpha dose itself, as well as QF and RBE, drops much more steeply with increasing depth in tissue than the proton dose. Analysis of the thickness distribution of a space suit due to the structural inhomogeneities shows that substituting the mean for the actual distribution introduces an error of only 2% in the surface tissue dose behind the suit materials. The findings indicate that a correct assessment of exposure in solar particle beams behind low shielding requires LET sensors in addition to instrumentation for measuring total rad doses.

R 5

26,754

Craig, A. INVESTIGATION OF THE CONCEPT OF DIRECT FLIGHT CONTROL. FINAL REPORT. Contract DA 31 124 ARO D 231, AR 65 1, Aug. 1965, 32pp. Aeronautical Engineering Dept., Wichita State University, Wichita, Kan. (AD 628087)

A system which provides direct and independent control of flight path speed, heading, and angle with the horizon was synthesized and evaluated in an analog computer simulation. Performance by Ss whose piloting experience varied from zero flight hrs. to 4000 flight hrs. was compared using direct control and conventional control systems. 2 primary results were obtained: 1st, the performance of a S with no flight experience using direct control was equal or superior to the performance of a S of 4000 hrs. experience using conventional controls, performance being measured in terms of mean square deviation from a proscribed flight path; 2nd, performance improvement varied inversely with pilot experience. The resulting control scheme utilized closed-loop devices with emphasis placed on simplicity and reliability.

R 4

26,755

Poli, C.R. & Hanavan, E.P., Jr. A THREE MASS RETRIEVAL STUDY FOR THE GEMINI TETHERED ASTRONAUT. Contract AF(615) 773 6 126, Proj. 7184, Task 718405, SEG TR 65 29, July 1965, 26pp. USAF Systems Engineering Group, AFSC, Wright-Patterson AFB, Ohio.

A mathematical model is developed and used to investigate the feasibility of a 3-mass retrieval technique considered for a future Gemini extravehicular operation. The technique consists of an astronaut moving along a tetherline connected between the Gemini spacecraft and an "anchor-mass" man and a "point-mass" anchor, and the equations of constraint relating the distance between the Gemini spacecraft, the astronaut, and the anchor mass. The trajectories of the astronaut and the anchor mass with respect to the spacecraft, the forces of constraint on the astronaut, and the angular-velocity components of the spacecraft are determined by solving the equations using various initial conditions for the astronaut, the anchor mass, and the spacecraft. Line-wrap, excessive spacecraft rotation rates, and excessive terminal velocities of the astronaut cause the retrieval technique to be considered unacceptable.

R 6

26,756

Poli, C.R. A STUDY OF RETRIEVAL TECHNIQUES FOR TETHERED ASTRONAUTS. Contract AF33(615)773 5 99, Proj. 7184, Task 718405, SEG TR 65 30, July 1965, 41pp. USAF Systems Engineering Group, AFSC, Wright-Patterson AFB, Ohio.

Mathematical models are developed and used for investigating the feasibility of 3 distinct retrieval techniques currently under consideration for future Gemini extravehicular operations. The retrieval techniques under consideration are the constant line tension technique, the constant reel-in speed technique, and the "anchor-mass" technique. The mathematical models for these retrieval systems are obtained by writing the rotational equations of motion for a rigid body satellite, the translational equations of motion for a "point-mass" man and a "point-mass" anchor, and the equations of constraint, which relate the distances between the spacecraft and the astronaut and between the astronaut and the anchor mass. The trajectory of the astronaut with respect to the vehicle, the forces of constraint acting on the astronaut, and the angular-velocity components of the vehicle are obtained by solving the equations using various initial conditions for the astronaut, the anchor mass, and the vehicle. Line-wrap, excessive spacecraft rotation rates, large constraint forces, and excessive terminal velocities of the astronaut cause these retrieval techniques to be considered unacceptable for long retrieval distances. For short retrieval distances, the problem of line-wrap may be minimized.

R 3

26,758

Nesterenko, V.S. EFFECT OF CORIOLIS ACCELERATION ON THE HUMAN ORGANISM. JPRS: 20,927, TT: 65 31426, July 1965, 17pp. US Joint Publications Research Service, Washington, D.C. (Transl: Uspekhi Sovremennoy Biologii, March-April 1965, 59(2), 246-256).

The following can be concluded on the basis of the literary data presented. A relatively small number of works are devoted to investigations of the effect of Coriolis acceleration on the human organism. The qualitative characteristics of this physical stimulant and the mechanism of its action on the vestibular apparatus have been developed relatively well. In regard to the pathogenesis of the disease, however, the opinions vary considerably. It is the opinion of some of the authors (Popov, Khilov, Graybiel, and Johnson) that Coriolis acceleration in addition to its action on the semicircular canals plays a definite etiological role in the origin and development of "canal sickness." The problem of the vestibular-vegetative reactions has not been adequately studied, although the vegetative disturbances form one of the most important indices of impaired work capacity. The other receptor systems have not been studied at all, although the data of some of the authors (A. P. Popov, Kennedy, Graybiel, and Johnson) point to the great importance of reflex actions of the muscles of the neck and the optical analyzer. In connection with the fact that the investigations which were conducted by A. V. Lebedinskiy, A. I. Arlashchenko, and others as well as by Kennedy and Graybiel under conditions of protracted slow rotation established the indicative capacity of this method to determine the susceptibility to air or motion sickness, the application of this method for the selection and training of proper contingents of people would be highly successful.

R 30

26,759

Moore, E.W., Cramer, R.L. & Dowd, P.J. EFFECTS OF MOTION SICKNESS ON THE DYNAMIC CHARACTERISTICS OF RESPONSES TO CORIOLIS STIMULATION. Task 775003, SAM TR 65 67, Sept. 1965, 4pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

Coriolis stimulation imposes a severe acceleratory stimulus on the vertical semicircular canals that simulates some sensations perceived by pilots of supersonic aircraft. This stimulus produces responses such as vertical nystagmus and occasional motion sickness. The rate of decay of nystagmic responses for a group of sick flyers was compared to the rate for a group of nonsick flyers for both directions of tilt. A significantly different rate of decay was demonstrated by the experimental groups. It was also shown that motion sickness reduces the rate of decay for both directions of stimulation. The results were discussed in terms of the relationship of recovery from nystagmus as it affects the summation of autonomic excitation.

R 5

26,760

Miller, E.F., II, Graybiel, A. & Kellogg, R.S. OTOLITH ORGAN ACTIVITY WITHIN EARTH STANDARD, ONE-HALF STANDARD, AND ZERO GRAVITY ENVIRONMENTS. Contract NASA Order R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 943, Rep. 119, Aug. 1965, 13pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

6 individuals with bilateral labyrinthine defects and 7 normal persons served as SS. Transient periods of subgravity force (0.5G, zero G) were produced by parabolic flight maneuvers in a specially equipped C-131B aircraft which accommodated a tilt chair and accessory apparatus for recording ocular counterrolling response to body tilt ( $\pm 25^\circ$ ,  $\pm 50^\circ$ ). Testing under 1.0G conditions was accomplished during periods of straight and level flight. The labyrinthine-defective (L-D) group revealed results which were qualitatively similar to those from the normal group but markedly reduced in magnitude. This demonstrated that extralabyrinthine factors were not significantly influencing extraocular muscle tonus, and therefore ocular counterrolling served as a valid and sensitive indicator of otolith activity under hypogravic conditions. In the normal SS zero G induced a physiological deafferentation of the otolith organs as indicated by the lack of any significant counterrolling response when the SS were tilted rightward or leftward up to  $50^\circ$ . When the gravitational force equalled approximately 0.5G, the magnitude of counterrolling fell substantially below the level midway between the zero and Earth standard gravity response curves. The nonlinear relationship between otolith activity and subgravity force that is implied in these data and confirmed in a follow-up study is discussed.

R 22

26,761

Miller, E.F., II, Fregly, A.R., van den Brink, G. & Graybiel, A. VISUAL LOCALIZATION OF THE HORIZONTAL AS A FUNCTION OF BODY TILT UP TO  $\pm 90^\circ$  FROM GRAVITATIONAL VERTICAL. Contract NASA R 47, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 942, Rep. 118, Aug. 1965, Aug. 1965, 25pp. USN Naval School of Aviation Medicine, NAMC, Pensacola, Fla.

The visual horizontal was determined for 3 sophisticated SS tilted laterally in  $10^\circ$  intervals within  $\pm 90^\circ$  from gravitational vertical. The task had adequate intratest reliability, but there were considerable intertest and intrasubject quantitative variations. Visual localization as a function of body tilt, however, was qualitatively similar among all SS and among the 13 test sessions of each S. Around upright there was a range (totaling  $20^\circ$  -  $40^\circ$  on the average) of body positions in which the deviation was not significant from that of upright. Inclinations beyond this range caused the E-phenomenon to appear and increase bilaterally up to a maximum of about the  $40^\circ$  -  $50^\circ$  position; with further inclination the deviation reversed direction and passed through the position ( $60^\circ$  -  $80^\circ$ ) of zero deviation to grow as the A-phenomenon. Responses were bilaterally symmetrical in certain respects for each of the SS. The variable error among all SS followed a similar (curvilinear) function of body attitude. Repetition of test without immediate knowledge of results did not as a rule end in reduction of errors.

R 35

26,762

Miller, A.B. PILOT RE-ENTRY GUIDANCE AND CONTROL. Contract NASw 869, NASA CR 331, Nov. 1965, 41pp. National Aeronautics & Space Administration, Washington, D.C. (Bunker-Ramo Corporation, Canoga Park, Calif.).

The present paper considers some of the problems confronting the pilot during a manually controlled re-entry, and some of the areas where additional research could most profitably contribute to a more complete knowledge of manual control. The relationship between re-entry vehicle configuration and the nature and severity of the manual control maneuvers is discussed. In terms of the energy available to control the vehicle, and the display-control relationship as they relate to the functions performed by the human operator. The importance of training through simulation is stressed and some of the areas where additional simulation studies are needed is pointed out. It is shown that the problem of escape continues to be a critical problem which requires considerable effort if a solution is to be attained. With regard to future needs, it is pointed out that simulation studies will continue to be one of the most important vehicles for research into manual control problems and that many more studies of the basic behavioral components of manual control are needed in order to develop more complete models of the human control process. In conclusion, several articles are summarized in the annotated bibliography which are representative of the research now being carried out concerning manual control during re-entry.

R 251

26,763

Michel, E.L., Smith, G.B., Jr. & Johnston, R.S. GASEOUS ENVIRONMENT CONSIDERATIONS AND EVALUATION PROGRAMS LEADING TO SPACECRAFT ATMOSPHERE SELECTION. NASA TN D 2506, Jan. 1965, 518 pp. National Aeronautics & Space Administration, Washington, D.C. (Manned Spacecraft Center, NASA, Houston, Tex.).

The NASA Manned Spacecraft Center has been actively involved in the direction and support of programs leading to the selection and validations of the atmosphere for forthcoming Gemini and Apollo missions. This paper discusses the engineering and physiologic considerations involved, describes the investigations to validate spacecraft atmospheres, and discusses the implications derived from the results of these investigations. The specific researches include: rapid decompression hazard after prolonged exposure to 50% oxygen-50% nitrogen atmosphere, physiologic effects of exposure to increased oxygen tension at 5 psia, effect of ventilating air flow on human water requirements, bacteriological studies of 2-man space cabin simulator, effects of prolonged exposure to pure oxygen on human performance, and effect of sequential exposure of the space capsule upon the physiologic adaptation of man.

R 265

26,764

Mehelas, J.N. & Pinc, B.W. THE RESPONSE OF SQUIRREL MONKEYS TO HIGH ACCELERATIVE FORCES. Contract NASw 851, NASA CR 236, June 1965, 322pp. National Aeronautics & Space Administration, Washington, D.C. (Space/Defense Corporation, Birmingham, Mich.).

220 squirrel monkeys (*Saimiri sciureus*) were exposed to accelerative forces from 50 G to 430 G at increments of approximately 50 G. Data recorded included clinical observations, electrocardiograms (ECG), gross pathology and histochemical changes in studied tissues. From these data it was concluded that *Saimiri sciureus* is capable of sustaining and surviving the continuous application of +430 G for 115.6 seconds. The test animal also survived lower G loads for longer dwell times (i.e., -50 G for 386 seconds), and appears capable of surviving even higher G loads applied over shorter time bases. Differences in acceleration tolerance were observed in accordance with the direction of load application.

R 14

26,765  
McGoff, M.J. POTASSIUM SUPEROXIDE ATMOSPHERE CONTROL UNIT. FINAL REPORT MARCH 1964-DECEMBER 1964. Contract AF 33(615) 1518, Proj. 6373, Task 637302, AMRL TR 65 44, MSAR Rep. 64 123, Sept. 1965, 44pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (MSA Research Corporation, Callery, Penn.).

Superoxides have been used in a new approach to atmosphere control systems for aerospace flight. This approach offered the control of dynamic systems and the low power requirement of passive systems. This technique can be adapted to unusual geometries with low weight and volume requirements. Potassium superoxide discs comprise the bulk of this new unit serving as a structural self-support and yet offering adequate CO<sub>2</sub> absorption and O<sub>2</sub> evolution. The discs are 3.77 in. in diameter x 3/16 in. thick and have a 7/8 in. diameter center hole. They are placed in a cylindrical aluminum housing with a 0.080 in. clearance between the shell and discs. The discs are separated from each other by integrally molded 1/16 in. protrusions. A 1-man version of the unit for 24 hr service weighs 12 lb, requires 17 watts power continuously, is 32 in. long x 4 in. in diameter and contains 110 discs. The disc configuration permits both radial and axial circulation at a throughput of 9 cfm and 1.6 in. of water ΔP. Tests with a 1-man simulator in a 130 cu ft compartment showed adequate O<sub>2</sub> delivery and control at < 1% CO<sub>2</sub>.

26,766  
McCally, M. BODY FLUID VOLUMES AND THE RENAL RESPONSE OF HUMAN SUBJECTS TO WATER IMMERSION. FINAL REPORT OCTOBER 1964-DECEMBER 1964. Proj. 7222, AMRL TR 65 115, Aug. 1965, 26pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

Immersion of human Ss in water is used to simulate various aspects of the aerospace environment, including weightlessness. However, little is known of the physiological cardiovascular and renal responses to immersion. Such data are necessary before responses to immersion can be related to other environments, such as aerospace. The excretion of water and solute by the kidney is the fundamental mechanism for preserving the constancy of the mammalian extracellular fluid. The mechanisms by which the kidney is notified to retain or excrete water and solute in response to changes in the environment have been defined in considerable detail in recent yrs. The response of the kidney to water immersion of human Ss, as measured by water and solute excretion, provides a fascinating model for the study of body fluid volume regulation. The Ama divers of Japan and Korea represent specific problems of body fluid volume regulation during immersion as dictated by the depth, duration, temperature, and respiratory mechanics of their particular immersion pattern. This report includes: a) a brief review of the physiological mechanisms of body fluid volume regulation as we now understand them; b) a description of the renal responses to neutral or indifferent temperature immersion; c) a consideration of the role of pulmonary mechanics and water temperature in the renal response to immersion; d) a summary of the possible mechanisms of the immersion diuresis and; e) speculations about the renal response to Ama diving.

R 53

26,767  
Malikin, V.B. THE PROBLEMS OF BIOLOGY OF SPACE FLIGHT. THE IDEAS OF TSIOLKOVSKI BECOME REALIZED. FTD TT 65 73/1+2, S/0026 059 000 010, May 1965, 21pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Priroda, 1959, 10, 35-44.). (AD 618644)

Those works of the early Soviet scientist K.E. Tsiolkovsky are reviewed which dealt with the medical-biological problems man would encounter in cosmic flight. His speculations and experiments in the field included: the determination of the effects of centrifugal force (using chicks and insects); the problem of developing protection vs accelerations (via submergence in a liquid of equal density); the methods of obtaining weightless states, e.g. free falling special chambers; the pressurization of the living quarters and the use of regeneration techniques for the internal atmosphere. These and other findings are related to recent accomplishments in the field of cosmic medicine.

R 13

26,768  
MacEwen, J.D. TOXIC HAZARDS RESEARCH UNIT, DESIGN AND CONSTRUCTION PHASE. Contract AF 33(657) 11305, Proj. 6302, Task 630201, AMRL TR 65 125, Aerojet-General Corp. Rep. 3024, Sept. 1965, 101pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Aerojet-General Corporation, Dayton, Ohio).

A facility was designed and constructed at Wright-Patterson Air Force Base for the specific purpose of conducting inhalation toxicology research. This facility is unique in that it has considerable functional variability and may be used for the study of space cabin toxicity under altitude and 100% oxygen conditions. Additionally, the laboratory was designed for use as a standard inhalation toxicology laboratory for the study of Air Force materials which may constitute a hazard to ground support personnel. This report describes the design and functional capability of the Toxic Hazards Research Unit laboratory which became operational in September of 1964. The areas discussed include: Ambient Pressure Laboratory; Ambient Pressure Laboratory Air Supply and Conditioning Systems; Ambient Pressure Laboratory Monitoring and Control Systems; Chamber Exhaust Air Cleaning Systems; Instrument Air System; Gas Dilution Facility; Reduced Pressure Laboratory; Liquid Oxygen Supply System; Reduced Pressure Laboratory Air Supply and Conditioning Systems; Dome Lifting and Support Equipment; Dome Communications; Safety Requirements; Standard Operating Procedure; Oxygen Prebreathing Stations; Research Equipment; Training Program for Personnel. Toxicology research of the nature described has been initiated and will be reported upon as individual experiments are completed.

26,769  
Lockhart, L.B., Jr. & Piatt, V.R. (Eds.). FOURTH ANNUAL PROGRESS REPORT. THE PRESENT STATUS OF CHEMICAL RESEARCH IN ATMOSPHERE PURIFICATION AND CONTROL ON NUCLEAR-POWERED SUBMARINES. Contract NRL Probs. C08 05, C08 18, C08 30, C08 32, C08 33, R05 24; Proj. SF 013 08 03, Tasks 4092, 4093, 4094, 4095, BuWeps SP 89422, NRL Rep. 6251, March 1965, 73pp. USN Research Lab., Chemistry Div., ONR, Washington, D.C. (AD 614261)

This annual progress report supplements NRL Reports 5465 of April 21, 1960, 5630 of July 14, 1961, 5814 of August 29, 1962, and 6053 of December 31, 1963, which provided a comprehensive review of the past and present research and development effort of the U.S. Naval Research Laboratory on the atmospheric habitability of submarines. Emphasis is at present being devoted almost exclusively to nuclear-powered submarines. Considerable progress has been made in the major efforts of developing: a) improved methods of sampling and analysis of atmospheres; b) additives to decrease the degradation of monoethanolamine (MEA) in the CO<sub>2</sub> scrubber; and c) a system for maximum utilization of the carbon in the main ventilation filter. Other topics covered in the present report include the use of algae for oxygen production and carbon dioxide absorption, a study of water-thinned, fire-retardant paints, and a differentiation scheme for look-alike carbon and catalysts.

R Many

26,770  
Lewis, S.T. A SPATIAL DISORIENTATION DEMONSTRATOR. Proj. 7750, SAM TR 65 7, March 1965, 5pp. USAF School of Aerospace Medicine, Brooks AFB, Texas.

A spatial disorientation device was designed and constructed at the request of the Tactical Air Command. This device is inexpensive, easy to operate, and portable. It combines the principles of the Barany chair and centrifuge. The purpose of this report is to describe this USAFSAM Spatial Disorientation Demonstrator.  
R 4

26,771  
Link, Mae M. SPACE MEDICINE IN PROJECT MERCURY. NASA SP 4003, 1965, 198pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C.

This volume covers the history of space medicine in Project Mercury. Chapters include ones on biotechnology, NASA long-range life sciences program, medical aspects of astronaut selection and training, biomedical aspects of life support systems, and biomedical planning for launch, tracking, and recovery. (HEIAS)

26,773  
Yeremin, A.V., Kas'yan, I.I., Kolosov, I.A., Kopanov, V.I., et al. HUMAN WORK CAPACITY UNDER CONDITIONS OF WEIGHTLESSNESS. JPRS 31,665, TT: 65 32160, Aug. 1965, 8pp. US Joint Publications Research Service, Washington, D.C. (Transl: Izvestiya Akademii Nauk SSSR, Seriya Biologicheskaya, May-June 1965, 2, 329-334).

During space flights lasting up to 5 days with cosmonauts remaining within the spacecraft well secured to work stations, their work capacity remains at a fairly high level. With increasing complication of working activity, increase in flight duration, and occupancy in an unsupported position, in several cases some decrease in level of work capacity is possible. For purposes of preventing the undesirable effect of prolonged weightlessness, the selection and medical-biological preparation of cosmonauts for the effect of this factor must be improved.  
R 13

26,774  
Alexander, L.T. & Cooperband, A.S. SYSTEM TRAINING AND RESEARCH IN TEAM BEHAVIOR. Tech. Memo. 2581, Aug. 1965, 65pp. System Development Corporation, Santa Monica, Calif. (AD 620606)

Characteristics of computerized command-control systems are considered to identify common training objectives. Several system training problems are identified. The importance of training a team to respond adequately to indeterminate situations is proposed as a primary training objective. Team training research literature is reviewed and a research program is outlined.  
R 70

26,775  
Wood, C.D., Kenndey, R.S., Graybiel, A., Wherry, R.J., Jr., et al. COMPUTER LIBRARY LITERATURE REVIEW ON EFFECTIVENESS OF ANTIMOTION SICKNESS DRUGS. Contract NASA Order R 93, BuMed Proj. MRO05.13 6001, Subtask 1, NAMI 949, Rep. 124, Nov. 1965, 15pp. USN Aerospace Medical Institute, NAMC, Pensacola, Fla.

A computer library of the antimotion sickness drug literature has been established at the Naval Aerospace Medical Institute, with information gained from a literature review in preparation for research on these drugs. The results of a similar review made by the Army-Navy-Air Force Motion Sickness Team were incorporated into this survey. The value of such a study is in the large number of Ss studied with the various drugs, the diverse stress conditions, and the variety of investigators presenting the reports. The obvious disadvantage is that similar emphasis is given to reports with varying degrees of strictness in experimental design. The major findings were as follows. The over-all effectiveness of the antihistamines was 70.6%; for the belladonnas it was 50.1%; and for the phenothiazines it was 44.9%. The over-all results of British studies indicated a greater effectiveness for the belladonnas than for the antihistamines, the reverse of U.S. studies. The effectiveness of the individual drugs against motion sickness is also reported. The over-all effectiveness of the drugs is compared in sea, air, and experimental motion studies.  
R 94

26,776  
Wing, J.F. & Touchstone, R.M. THE EFFECTS OF HIGH AMBIENT TEMPERATURE ON SHORT-TERM MEMORY. FINAL REPORT SEPTEMBER 1961-MAY 1963. Proj. 1710, Task 171002, AMRL TR 65 103, Sept. 1965, 20pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

The present study was designed to determine whether or not an increase in ambient temperature impaired man's ability to recall aurally-presented messages, and whether impairment was greater for some types of messages than for others. On 3 separate days, 15 men were exposed for 1 hr. in an all-weather chamber to each of 3 different effective temperatures (ET): 72°, 90°, and 95°F. During each day's session they were given 5 successive recall trials on each of 6 different messages. The men had to work continuously during each hour-long session. The results showed that average recall dropped significantly as environmental temperature was increased. The recall decrement between 90° and 95°F was statistically significant, but the drop in recall between 72° and 90°F was not significant. Messages of all types suffered approximately equal decrements under the high temperatures.  
R 20

26,777  
Stoudt, H.W., Damon, A., McFarland, R. & Roberts, Jean. WEIGHT, HEIGHT, AND SELECTED BODY DIMENSIONS OF ADULTS. UNITED STATES - 1960-1962. Series 11, Number 8, June 1965, 44pp. US Department of Health, Education, & Welfare, Washington, D.C. (Harvard School of Public Health, Boston, Mass.).

Findings on selected measurements of physique from the health examination survey among adults in the civilian, non-institutional population, aged 18-79 years in 1960-62 are given: Age and sex distributions for weight, height, erect sitting height, normal sitting height, knee height, popliteal height, elbow rest height, thigh clearance height, buttock-knee height, buttock-popliteal height, elbow-to-elbow breadth, and seat breadth. (HEIAS)  
R 64



26,778

Zavala, A., Locke, E.A., Van Cott, H.P. & Fleishman, E.A. THE ANALYSIS OF HELICOPTER PILOT PERFORMANCE. FINAL REPORT, 1 JULY 1964-30 JUNE 1965. Contract DA 49 193 MD 2632, Rep. AIR E 29 6/65 TR, June 1965, 114pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (American Institutes for Research, Washington, D.C.). (AD 471995)

The objective of this study was to explore ways in which performance in helicopter pilot-ing might be described in terms of its component skills. A variety of techniques was employed (task analysis, discussions and interviews with skilled helicopter pilots, demonstration flights, etc.) to become familiar with the helicopter pilot's task. The primary approach followed was to conduct a series of correlational and factor analytic studies to better understand the basic skill dimensions involved. Performance measures were taken on 966 helicopter pilot trainees on 481 variables. Of the series of factor analyses performed, one was done using data representing performance on separate helicopter maneuvers such as hovering, landing, and autorotation. Another factor analysis was performed using more detailed and rather specific measures of the sub-task performances carried out within maneuvers. The results provided factors that confirmed one intuitively logical set of abilities obtained from task analysis and from aerodynamic and propulsion system dynamics. The results have a number of applications to problems of helicopter pilot proficiency measurement and training as well as to helicopter systems problems. They also provide a framework for further re-search in both field and laboratory studies of this highly complex task.

R 37

26,779

Weisz, A.Z., Goddard, Connie & Allen, R.W. HUMAN PERFORMANCE UNDER RANDOM AND SINUSOIDAL VIBRATION. FINAL REPORT APRIL 1964-May 1965. Contract AF 33(615) 1908, Proj. 1710, Task 171002, AMRL TR 65 209, Dec. 1965, 49pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Hughes Aircraft Company, Culver City, Calif.).

2 experiments tested human Ss under whole-body vertical vibration to: a) compare effects on performance of 5 cps sinusoidal, 5 cps random amplitude, and 4-1 cps random vibration equated on the basis of power, and b) determine acceleration levels at which significant performance decrements are found for each type of vibration. The complex experimental task required 2-dimensional compensatory tracking, visual monitoring, and auditory monitoring during 20-min. vibration exposures at levels equated to 5, 15, 25, and 30% of the decrements under vibration were restricted to tracking, the most demanding component of the task complex. Tracking performance deteriorated with increasing acceleration levels of each type of vibration. Overall performance differences associated with the different types of vibration equated on the basis of power were not significant. A number of task and procedural variables, including task difficulty, work-rest cycle, and prior experience appear to be important determinants of performance capabilities and fatigue effects found in vibration studies, indicating a need for further investigation of these variables.

R 12

26,780

Vollmer, H.M. WORK ACTIVITIES AND ATTITUDES OF SCIENTISTS AND RESEARCH MANAGERS: DATA FROM A NATIONAL SURVEY. Contract AF 49(638) 1028, Proj. 9779 01, Rep. IM 3580, May 1965, 218pp. Stanford Research Institute, Menlo Park, Calif. (AD 620376)

This report constitutes a basic data source on the organizational relations, activities, and attitudes of scientists and research managers in a variety of contexts throughout the United States. The data were obtained from a national survey of scientists and research managers in 4 disciplines--biology, chemistry, mathematics, & physics--using random samples of members of professional associations, and are broken down by 5 major variables: professional affiliation, type of employer, geographic region, educational level, and age. This is a descriptive report and largely consists of a tabular presentation of data accompanied by brief textual summaries of outstanding findings. As presented, the data are susceptible to further analysis and interpretation according to specific interests of the reader. Illustrative of the results are the following: in contexts where basic research goals are most likely to be emphasized (in universities, in many nonprofit research organizations, in some government agencies and departments, and in certain types of industries) research activities are most often organized in a unit or department separate from development activities. In contrast, where applied research goals are most emphasized research and development are more often encompassed within the same organizational unit. Attitudinal data show that "freedom to select research projects to work on" is one of the characteristics scientists most frequently mention as desirable in a work environment--especially among scientists in contexts oriented toward basic research.

R 8

26,781

Van Deusen, B.D. A STUDY OF THE VEHICLE RIDE DYNAMICS ASPECT OF GROUND MOBILITY. VOLUME II. HUMAN RESPONSE TO VEHICLE VIBRATION. FINAL REPORT. Contract DA 22 079 eng 403, Contract Rep. 3 114, Order 400, March 1965, 71pp. USA Engineer Waterways Experiment Station, Vicksburg, Miss. (Chrysler Corporation, Detroit, Mich.).

This report summarizes the existing literature in the area of human response to vibration and interprets it in the vehicle environment context. Comparisons are made among the shake table approaches to determine human response to vibration as a function of frequency. Several examples of ride comfort studies in actual vehicle environment are also discussed. The problem of magnitude estimation is discussed in detail and both ratio judgement and cross-modality techniques are suggested as approaches. The first Appendix includes details of a feasibility study performed in the field to make ride measurements using the cross-modality technique. A second Appendix includes a research plan which is considered a sound next step in definition of human response to vehicle vibration in the cross-country environment.

R 34

26,782

Tucker, G.J., Hand, D.J., Godbey, A.L. & Reinhardt, R.F. AIRSICKNESS IN STUDENT AVIATORS. Proj. MR005-13 6001, Subtask 6, NSAM 939, July 1965, 7pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

1067 student naval aviators were rated at the end of each flight during the pre-solo and basic acrobatic phase of training by the flight instructor for the presence or absence of nausea or vomiting during the flight. To be so rated, the airsickness had to be severe enough to cause inability to control the aircraft. In this manner, a profile of the patterns of airsickness was obtained on each student over the course of the primary flight training. The incidence of this type airsickness was 17.6% (188 students out of 1067). Correlations between incidents of airsickness per student and their ground school grades and flight grades were not statistically significant. There are 3 main periods during which the majority of airsickness occurs (79%). These are the initial 3 training flights, the 7th, and the 1st 3 dual acrobatic flights. These periods are closely correlated with the various and different peaks of physiologic and psychologic stresses during this phase of training and provide useful baselines for the evaluation of airsickness in student aviators.

R 3

26,783

Trumbull, R. ENVIRONMENT MODIFICATION FOR HUMAN PERFORMANCE. ONR Rep. ACR 105, July 1965, 68pp. USN Office of Naval Research, Psychological Sciences Div., Department of the Navy, Washington, D.C.

Human performance is determined by interaction between a variety of environments. These include the physical, the social and cultural, and the personal environments in which man lives, through which he expresses himself, and on the basis of which he performs. Influence is exerted by the various factors or elements as they exist as well as how they are perceived by him. Characteristically, these environments have been studied by different disciplines, which have reported findings and recommendations through their own journals. This is an attempt to bring relevant data together in a meaningful pattern. It allows fuller appreciation of the contributions of each "environment" and the requirements for consideration of the total picture. It is a review of the established limits of these many factors as a guide toward presenting optimum conditions for man's performance. The full story has yet to be told through interdisciplinary and more comprehensive research with performance as the one criterion. Each topic is presented with some results of the more promising techniques for overcoming the influence of the factor involved upon performance.

R 333

26,784

Straly, W.H. & Adlhoj, R.W. STUDY OF THE RETRIEVAL OF AN ASTRONAUT FROM AN EXTRA-VEHICULAR ASSIGNMENT. Contract NAS 1 2577, NASA CR 185, Feb. 1965, 221pp. National Aeronautics & Space Administration, Washington, D.C. (Marquardt Corporation, Van Nuys, Calif.).

This study considers the retrieval of a tethered astronaut from an extra-vehicular assignment. In general, an investigation of the properties of 2 tethered objects in an orbit and an analysis of the problems associated with effecting a union of the 2 are considered. It was found that successful retrieval can be made only over a narrow range of conditions when angular momentum is conserved. Angular momentum dissipation techniques, however, extend the operational envelope so that retrieval can be accomplished over a wide range of conditions. The philosophies and techniques developed may be utilized in other orbital applications such as space vehicle rendezvous and docking, satellite inspection, trajectory alteration, remote handling, etc.

R 23

26,785

Speckmann, E.W., Smith, K.J., Offner, K.M. & Day, J.L. PHYSIOLOGICAL STATUS OF MEN SUBJECTED TO PROLONGED CONFINEMENT. FINAL REPORT FEBRUARY 1963-FEBRUARY 1965. Contract NASA R 85, Proj. 7164, Task 716405, AMRL TR 65 141, Dec. 1965, 10pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

To determine if confinement of men resulted in physiological changes, 12 men in groups of 4 each were confined for 28 consecutive days. During this time, daily measurements of ECG, EEG, blood pressure, respiration, and oral temperature were made. Oxygen consumption and carbon dioxide production were measured daily on 4 Ss for 6 days before and for 6 days following confinement as well as 3 times weekly during confinement. With 8 Ss, the same measurements were made before, during, and following exercise on a bicycle ergometer at a rate causing the S to expend an average of 70 additional kcal per hour above resting values. The same metabolic measurements were made on 4 Ss 2.5 hours postprandial. The metabolic responses to confinement as well as exercise during confinement were measured. In general, there were no significant measured physiological changes from pretest control values resulting from prolonged confinement. Heart rate increased during the first few days and during the last few days of confinement. Although the Ss demonstrated an increased exercise tolerance, they showed a decrease in metabolic efficiency as a result of confinement and/or reduced activity. Resting energy production increased from 93 kcal per hour before confinement to 112 kcal per hour following confinement. A basal energy expenditure of 72 kcal was increased 8% due to specific dynamic action. These results suggest that men can readily adjust physiologically to prolonged periods of restricted activity provided sufficient exercise is available to maintain metabolic efficiency.

R 24

26,786

Snyder, R.E. & Yakut, M.M. LIFE SUPPORT SYSTEM OPERATION AND MAINTENANCE IN A MANNED SPACE CABIN SIMULATOR. Report from: "AIAA Second Annual Meeting, San Francisco, California, July 26-29, 1965." AIAA Paper 65 502, July 1965, 23pp. Missiles & Space Systems Div., Douglas Aircraft Company, Inc., Santa Monica, Calif.

This report represents the results from the first phase of a 3-phase program that will provide step-by-step development and improvement of integrated life support systems. The 3 phases are: Phase I-space laboratory life support subsystems are installed and operated in a manned space chamber without water and oxygen recovery from waste; Phase II-same as Phase I except the water recovery equipment is added to close the water cycle, and space suit operation in the cabin and airlock are included; Phase III-same as Phase II except an oxygen recovery unit is added to close the oxygen cycle. Each phase begins with a checkout test and is ended with a 30-to-60 day run. Results of the life support subsystem tests, toxicology program, and space cabin simulator manned test are presented. Also, the required crew selection and training program and the generalized life support system Fortran computer program are discussed.

26,787

Van Genderen, L. OPERATIONAL EVALUATION OF THE VARIOUS METHODS OF VISUAL DARK ADAPTATION. ABROAD FBH SUBMARINES. BuMed Proj. MR005.14 2001 4.08, Memo. Rep. 65 7, Feb. 1965, 13pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 474970)

This study evaluates the use of an improved style monocular eye patch developed by MRL to aid in visual dark adaptation for submarine periscope observations. Comparison of the degree and effects of adaptation attained under actual and simulated operations were made with the use of the patch in comparison with red goggles. Measurements of the adaptation attained were taken on board the USS ABRAHAM LINCOLN (SSBN602) with a compact portable device, developed by MRL and dubbed the "OWL"; this device presents to the S test stimuli of progressively lower intensities. This study demonstrated the value of the use of such a patch, both in the area of improvement of dark adaptation over present methods, and in the comfort and effectiveness of the person while adapting. The objective of lighting in the control area of an FBH submarine for both the crew and the periscope operator are discussed. The role of the use of the eye patch in helping to achieve these objectives is presented. Recommendations are made to provide the submarine fleet and in particular, FBH submarines, with dark adaptation patches of this type and to examine the lighting changes that the use of such patches would allow.

R 5

26,788

Shemetillo, I.G. & Molchanov, Ye. V. EFFECT OF UNIPOLAR NEGATIVE AEROIONIZATION ON THE MOTOR REACTION OF HUMAN SKELETAL MUSCLE. JPRS: 30,233, TT: 65 31074, May 1965, 3pp. US Joint Publications Research Service, Washington, D.C. (Transl: Voprosy Kurortologii, Fizioterapii i Lechebnoy Fizicheskoy Kultury, Sept.-Oct. 1964, 5, 433-435).

The purpose of this study was to determine the effect of therapeutic doses of negative aeroions on the motor reaction of human skeletal muscle. Specifically, the motor reaction of the abductor muscle of the little finger to rhythmic stimulation by a tetanizing current was studied. 31 Ss participated in the experiment. After background myogram was recorded, the S was exposed to negative aeroionization. As soon as the session was over, another myogram was recorded under the same conditions. The aeroionizer generated (at a distance of 40 cm) 1,070,000 negative aeroions in 1 cm of air. Each session lasted from 10 to 18 minutes according to the dose of negative aeroions. Of 31 investigations, 11 involved a dose of 60 billion negative aeroions, 20 involved a dose of 30 to 150 billion aeroions. Not having observed regular changes in efficiency under the influence of negative aeroions, experiments with simulated aeroionization were conducted. During these sessions the electrode with the radioactive substance was replaced with a wooden model. The data reveal that simulated aeroionization, unlike aeroionization with negative aeroions, increases the efficiency of skeletal muscle. This phenomenon may be explained as follows. The stream of air during a session of simulated aeroionization mechanically stimulated the exteroceptors in the facial and cervical skin and reflexly increases the tone of the central nervous system, thus increasing the efficiency of skeletal muscle. On the other hand, it is reasonable to assume that the negatively charged aeroions which enter the respiratory tract cause electrophumoral and neuroreflex changes that inhibit the motor reaction of skeletal muscle.

R 0

26,789

Galanter, E. & Holman, G.L. SOME INVARIANCES OF THE ISOSENSITIVITY FUNCTION AND THEIR IMPLICATIONS FOR THE UTILITY FUNCTION OF MONEY. Contracts NONR 477(34) & DA 49 193 MD 2713, PLR 18NA, Dec. 1965, 24pp. USN Office of Naval Research & USA Medical Research & Development Command, Washington, D.C. (University of Washington, Seattle, Wash.).

4 experiments were performed in which human observers reported whether or not they could detect the difference in amplitude between a pair of acoustic stimuli presented on each of several thousands of trials. In one experiment the probability that the pair differed was systematically varied. In another experiment the relative monetary value to the observer of reporting the differences was systematically varied. In a third experiment the instructions to the subject were systematically varied, and in a fourth experiment the monetary value of reporting a difference was altered by multiplying the rewards by a positive constant. In the first three experiments the iso-sensitivity function, the function that describes the relation between correct reports of a difference and false reports of a difference, was unchanged under all conditions. In the fourth experiment the absolute response probabilities of correct detections and false reports were reproduced even though 5-fold changes in monetary value were made. This last result lends additional empirical support to the accumulating evidence that the utility function of money is a power function.

R 8

26,790

Hercules, F. & Butler, R. ORBITAL TESTING REQUIREMENTS FOR GUIDANCE AND CONTROL DEVICES. VOLUME I. Contract NASw 1067, NASA CR 355, Dec. 1965, 99pp. National Aeronautics & Space Administration, Washington, D.C. (McDonnell Aircraft Corporation, St. Louis, Mo.).

This report is the first of 2 volumes (HEIAS 26,701) on the determination of what guidance and control technologies would require or could profit from orbital testing. The chapter headings are: ground test capability--vacuum, thermal, radiation, zero g, other environmental factors; candidate orbital experiments--vehicle controls, attitude reference sensors, navigation sensors and environment and lift tests; experiment selection process; selected experiments; and experiment payload considerations. (HEIAS)

R 154

26,791

Ramey, J.W. TELEVISION IN MEDICAL TEACHING AND RESEARCH. (A SURVEY AND ANNOTATED BIBLIOGRAPHY). Contract SAE 9476, OE 34040, ca. 1965, 155pp. US Department of Health, Education & Welfare, Office of Education, Washington, D.C. (Council on Medical Television, Duke University Medical Center, Durham, N.C.).

In Part I of this report a survey is made of the distribution of TV installations by academic field or department. A section entitled 'General Reaction to the Use of Television' follows. Part II contains a bibliography and abstracts of relevant journal articles. Abstracts in the following areas are included: Basic Sciences; Endoscopy; Eye, Ear, Nose and Throat; Microscopy; Postgraduate Education; Psychiatry; Radiology; Research and Diagnostic Instrumentation; Surgery; Miscellaneous. A S index to the bibliography and an author index to the bibliography are included.

26,792

Rocklyn, E.H. A SELF-INSTRUCTIONAL TACTICAL LANGUAGE COURSE IN RUSSIAN. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task CONTACT, Subtask 11, Tech. Rep. 65 14, Dec. 1965, 74pp. Human Resources Research Office, George Washington University, Alexandria, Va.

To enable the combat soldier to obtain perishable, tactical information from newly captured prisoners of war, a brief, self-instructional Russian language course was developed and evaluated. Materials obtained from questionnaires administered to combat-experienced personnel were reviewed and refined, resulting in a final version of course content that covered areas of information likely to be used in any offensive or defensive questioning situation. The course was taken by 13 students having language aptitudes ranging from 0 to the 97th percentile on the Army Language Aptitude Tests. Upon completion, they were tests on content acquisition of all material in the course and on ability to use the material to obtain information from native Russians during simulated combat-area questioning. The results were a mean of 93% correct for speaking and understanding Russian and an 89% mean in translating answers given by the Russians, thus demonstrating the feasibility of such a course. The structure and questioning techniques seem effective in helping to elicit understandable answers from non-English-speaking personnel and may serve as a basis for development of similar courses in other languages.

R 5

26,793

Schum, D.A., Goldstein, I.L. & Southard, J.F. THE INFLUENCE OF EXPERIENCE AND INPUT INFORMATION FIDELITY UPON POSTERIOR PROBABILITY ESTIMATION IN A SIMULATED THREAT-DIAGNOSIS SYSTEM. FINAL REPORT, 1 OCTOBER 1963-1 JUNE 1964. Contract AF 33(657) 10763, Proj. 7184, Task 718403, AMRL TR 65 25, April 1965, 70pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Aviation Psychology Lab., Ohio State University, Columbus, Ohio).

This report describes 2 experiments in which posterior probability estimates made by humans are compared with similar estimates made by a computer using a modification of Bayes' theorem incorporating human estimates of  $P(D/H)$ . The task was to estimate, on the basis of intelligence data from a simulated threat-evaluation situation, the likelihood of various alternative hypotheses that could account for the observed data. The purpose of the first experiment was to determine the effect of increased experience upon the human's ability to estimate posterior probabilities. With increased experience the Ss' performance improved. In terms of the size of the estimates placed in the correct-hypothesis category there were no overall statistically significant differences between the Ss' estimates and the Bayesian calculations. However, the Bayesian solution placed significantly more first-choice estimates in the correct hypothesis categories. The purpose of the second experiment was to compare human and automated posterior probability estimates under several levels of input data fidelity. It was predicted that, under low fidelity conditions, human posterior probability estimates would become increasingly inferior to automated solutions. This hypothesis was only partially confirmed. In both experiments, but particularly in the second, the humans provided higher posterior probability estimates than the certainty in the data justified. Several reasons for these excessive estimates are discussed. With respect to the design of the diagnostic systems the present research tends to confirm the feasibility of automated Bayesian hypothesis-selection incorporating expert human estimates of the conditional probabilities  $P(D/H)$ .

R 19

26,794

Sumby, W.H. INCREMENTAL OR ONE-TRIAL LEARNING OF VERBAL SERIES. Proj. 7682, Task 768201, ESD TR 64 555, Oct. 1965, 21pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

The purpose of this study was to demonstrate that with judicious selection of stimulus material, evidence can be gathered to support either an incremental learning position or an all-or-none position. It is shown that if the a priori response probabilities of words in a series are high, the retrieval of that series from memory will lend support to the all-or-none point of view. If, on the other hand, the a priori probabilities are low, the incremental position will be upheld. It is concluded that learning is incremental, but that high response probability will tend to mask the supporting evidence.

R 6

26,795

Sheridan, T.B. (Princ. Investigator). DESIGN AND USE OF INFORMATION SYSTEMS FOR AUTOMATED ON-THE-JOB TRAINING. VOLUME V. FINAL REPORT. Contract AF 19(628)455, Proj. 7682, Task 768204, ESD TDR 64 234, April 1965, 15pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Bio-Dynamics Incorporated, Cambridge, Mass.).

This report describes the results and conclusions of a study which was directed at the development of principles for the design of automated instructional subsystems for Information Systems. A series of 4 Technical Documentary Reports have been issued which describe in detail the activities and results of each aspect of the study. This report brings together and summarizes the results reported in the individual documents, and includes additional items which did not warrant separate documentation.

R 12

26,796

General Electric Company, TEMPO. BLAST AND SHOCK SIMULATION FACILITIES IN THE UNITED KINGDOM, CANADA, AND THE UNITED STATES. Contract DA 49 146 XZ 282, DASA Proj. NWER, Subtask 07. 008, DASA Rep. 1627, Spec. Rep. 27, April 1965, 126pp. US Defense Atomic Support Agency, Washington, D.C. (DASA Data Center, General Electric Company, TEMPO, Santa Barbara, Calif.). (AD 462106)

This is a survey of blast and shock simulation facilities discussed at the Tripartite Cooperation Program meeting on 16 March 1964. The material on each facility includes an introduction, description and specifications, test parameters, instrumentation, and future plans. The facilities are: U.S. Air Force Weapons Laboratory Facilities, U.S. Navy Conical Shock Tube Facilities, Canadian Blast Facilities, United Kingdom Large Shock Tube Facility, U.S. Army Blast Load Generator and Associated Equipment, U.S. Naval Dynamic Loading Facilities, U.S. Air Force Rocket Sled Test Facilities, U.S. Army Shock Tube Facilities, U.S. Navy Explosion Facilities, and Defense Atomic Support Agency-AEC-Lovelace Foundation Blast Simulation Facilities.

R 23

26,797

Parin, V.V., Zakrzhevskiy, Y.B. & Bayevskiy, R.M. CLINICAL AND PHYSIOLOGICAL ASPECTS OF INTERPLANETARY AND ORBITAL FLIGHT. JPRS 29,795, TT 65 30839, April 1965, 16pp. US Joint Publications Research Service, Washington, D.C. (Transl: Klinicheskaya Meditsina (Clinical Medicine), Feb. 1965, XLIII(2), 3-6).

2 articles are included in this document. The first, entitled "Clinical Aspects of Interplanetary Flights", considers the following problems: a) The necessity to consider in detail the possible illnesses of astronauts during a long-term flight, and the methods of diagnosis and treatment under these specific conditions; b) The concept of variable probability of diseases occurring during interplanetary travel. Under specific conditions the probability of some diseases is increased while that of others is decreased. The probability statistical approach is also needed for the training program of an interplanetary physician. He cannot be a general purpose specialist, but must be highly skilled in the area of the most frequently encountered pathology; c) Automation of the diagnosis and of the medical aid. In the second article an attempt is made to give a clinicophysiological evaluation of the seismocardiographic data obtained during flights of the spaceships "Vostok-5" and "Vostok-6". For this purpose the telemetric recordings of seismocardiograms were compared with seismocardiograms of 38 healthy persons and of 74 patients. The juxtaposition of seismocardiographic changes observed in astronauts, with the various deviations of the seismocardiograms of patients, made it possible to find a number of analogies and to advance a number of hypotheses concerning the mechanism of alteration in blood circulation resulting from prolonged action of weightlessness.

R 6

26,798

Koreshkov, A. A HUMAN EXPOSED TO EXTREME CONDITIONS OF SPACE TRAINING. JPRS 31,250, TT: 65 31747, July 1965, 4pp. US Joint Publications Research Service, Washington, D.C. (Transl: Technika - Molodezhi, 1965, 6, 18-19).

The selection and training of astronauts is briefly considered.

26,799

Stephenson, R.R. NAVAL ADJUSTMENT AND DELINQUENCY: A REVIEW OF THE LITERATURE WITH RECOMMENDATIONS FOR FUTURE RESEARCH. Task 3.1605.05.01.S2, Res. Memo. SRM 65 4, May 1965, 66pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 620321)

A comprehensive review of the literature concerning the naval delinquency problem was undertaken. This review led to a summarization of all relevant research findings and a further summarization of the recommendations of earlier writers in this area. Following a critical evaluation of both summaries and of the assumptions underlying the traditional approach, it was concluded that the traditional approach to the identification of the delinquent-prone was approaching an asymptote of effectiveness. Accordingly, a new approach, based upon the concepts of occupational choice, satisfaction, and adjustment, is recommended. A comprehensive, but general, research design is proposed to investigate and evaluate this new approach.

R 163

26,800

Segawa, T. THE PAST AND PRESENT OF SUBMARINE FOOD PROVISIONS. Proj. G7 1050, FSTC 381 T65 255, June 1965, 11pp. USA Foreign Science & Technology Center, Washington, D.C. (Transl. from: Japanese, Ordnance & Technology, 1964, 210, 48-53). (AD 466885)

Crews of submarines operating in the south during World War II became greatly fatigued from high temperature and high humidity in the submarines, and having poor appetites, they only ate polished rice. Meats and vitamin tablets which were especially placed on the table were ignored for some reason, particularly by the younger crew members, and beriberi and even cases of malnutrition broke out, hampering some of the submarines in their military operations. Since the war, together with the improvement of the people's nutrition standard, the amount of food for the Maritime Self-Defence Corps has been rationally determined within the framework of adequacy, and it is hoped that food, which sustains the physical strength of crew members, will be used skilfully and made to contribute to the boosting of morale.

26,801

Forbes, T.W., Mullin, J.J. & Simpson, M.E. INTERCHANGE SPACING AND DRIVER BEHAVIOR EFFECTS ON FREEWAY OPERATION. Report from: "Third International Symposium on the Theory of Traffic Flow, New York City, N.Y., June 1965, 13pp. Psychology Dept., Michigan State University, East Lansing, Mich.

In this project a special sweep-sampling 35mm air photo technique using a light airplane was used to record traffic flow during morning and afternoon traffic peaks on 3 sections of an urban freeway in Detroit. 12 flights each obtained photographic records sampling about 40 min. of peak hour morning or afternoon traffic. Approximately 72 orbits (144 sweeps) and 22,000 individual pictures resulted. For statistical comparisons, 8 of the weekday records (4 morning & 4 afternoon) were selected for completeness of sampling. Each yielded approximately 100 samples or a total of about 800. Systematic procedures were developed for measuring in selected samples of pictures the positions of individual cars, correcting for slant range and calculating volume, speed, time headway and space headway, and acceleration. Samples of up to 5 cars per lane were followed and their positions measured for 5 sec. The method showed good correspondence with ground volume records; statistically reliable comparisons were obtained. On the 6 highway sections (3 in each direction), a lower average speed and more actual slow downs and stoppages occurred in section 2 under (outbound) peak traffic conditions. This indicated interference with flow because of the relatively close spacing of 2 on-ramps and an off-ramp in this section as compared to 1 on-ramp and 2 off-ramps on the opposite side of the highway and to greater spacings in other sections studied. Section 4 showed the 2nd lowest average speed apparently related to its close on-off-ramp spacing in combination with double heavy right and left on-ramps feeding it. Differing flow-density relationships were found for the 1st time on different sections of the same freeway.

R 1

26,802

Cox, J.A., Wood, R.O., Boren, Lynn M. & Thorne, H.W. FUNCTIONAL AND APPEARANCE FIDELITY OF TRAINING DEVICES FOR FIXED-PROCEDURES TASKS. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 03, Tech. Rep. 65 4, June 1965, 44pp. Human Resources Research Office, George Washington University, Alexandria, Va. (AD 617767)

Research was performed to determine the effects on proficiency development of using devices of less-than-perfect fidelity for training men to perform a lengthy fixed procedure. In a series of experiments the fidelity of training devices was lowered in either functional or appearance quality. A fixed procedure was defined as a part of a job in which all signals to, and actions by, the incumbent are specified in an invariable sequence and are simple enough that a trainee either will already know, or can readily learn, how to perform each individual step. A 92-step procedure, considered to be representative of procedural tasks in general, was used as an example of a fixed-procedure task for this research. This procedure concerned the operation of the Section Control Indicator (SCI) console of the Nike Hercules guided missile system when missiles are being prepared for firing (Blue Status) and being fired (Red Status). 5-man groups were trained with each of the 12 training devices until 15 or 20 men had been trained with each device. Each trainee was administered a proficiency test, and his total training time was recorded. Men trained on low fidelity devices were as proficient as those trained with devices high in functional and appearance fidelity. A field test of the above findings was performed, in which military instructors trained soldiers to perform this task as part of Advanced Individual Training for Military Occupational Specialty (MOS) 177. Some instructors used the actual live equipment during this training while other instructors used the full-sized line drawings of the panel. Only chance differences were found between the average proficiency scores or training times of the men trained under both conditions. The results of other research were compared to the above findings and largely tend to confirm them. R 16

26,803

Gavonius, C.R. HUMAN VISUAL ACUITY MEASURED WITH COLORED STIMULI. FINAL REPORT 1 SEPTEMBER 1964-31 AUGUST 1965. Contract DA 49 193 MD 2666, HSR RR 65/8 Cr, Sept. 1965, 37pp. USA Medical Research & Development Command, Office of the Surgeon General, Washington, D.C. (Human Sciences Research Incorporated, McLean, Va.).

Previous studies of visual acuity have dealt almost exclusively with achromatic brightness differences. The present study measures acuity under conditions in which the target and surround are equated in brightness but differ in wavelength. It has been suggested that acuity should always be less under these conditions, since monochromatic stimuli may stimulate fewer foveal color sensitive receptors than "white" stimuli. Light from 2 monochromators illuminated alternate bars of a grating target. The resulting stimuli were presented in modified Maxwellian view and appeared to the observer as a 1° grating of colored lines in a neutral surround. A zoom system varied the angular subtense of the lines. When the grating consisted of alternate colored and black lines acuity was fairly constant (about 1.30) from 430 nm to 670 nm. Equally good acuity could be obtained when alternate lines were matched for brightness, provided that the wavelength separation between adjacent lines was adequate. This separation is minimum in the blue and increases toward the red; it does not appear to be simply related to wavelength discrimination. When maximum acuity has been reached by wavelength separation no further improvement can be made by introducing a brightness difference. It is concluded that wavelength difference can be a sufficient condition for good visual acuity. R 39

26,804

Biser, E. & Millman, G. TABLES OF OFFSET CIRCLE PROBABILITIES FOR A NORMAL BIVARIATE ELLIPTICAL DISTRIBUTION. DA Proj. IP6 20801 A 187, DA Task Nr. IP6 20801 A 187 01 01, ECOM 2625, Aug. 1965, 210pp. USA Electronics Command, Fort Monmouth, N.J.

This report consists of 2 major parts. The first deals with the development of formulas for computing the probability that a point taken from a normal bivariate elliptical distribution with specified mean ( $\bar{x}$ ,  $\bar{y}$ ) and standard deviations ( $\sigma_x$ ,  $\sigma_y$ ) shall fall within a circle of given radius (R) whose center is displaced a given distance (D) from the center of the distribution. The second part consists entirely of probability tables. The entries (input parameters) to these tables are given in units standardized with respect to  $\sigma_x$ , namely:  $R/\sigma_x$ ,  $D/\sigma_x$ ,  $\sigma_y/\sigma_x$ . The spectra of values for these input parameters are as follows:  $\sigma_y/\sigma_x$ : 0.0(0.2) 4.0;  $R/\sigma_x$ : 0.0(0.1) 4.5;  $D/\sigma_x$ : 0.00(0.05) 5.00. These tables will prove especially useful in dealing with problems involving accuracy studies of weapons systems and with other problems notably in meteorological studies. The events in many practical probability problems are best described by a normal bivariate elliptical distribution with unequal standard deviations. For example, one may be confronted with the problem of evaluating the probability that a missile will hit a circle of a specified radius whose center (aim point) is displaced a given distance from the mean (of impact points) of a normal bivariate elliptical distribution. In this example the impact points are governed by a normal (Gaussian) bivariate elliptical density function; the mean of this distribution is not zero (i.e., the center of the distribution is not about the aim point). R 5

26,805

Ammerman, H.L. A MODEL OF JUNIOR OFFICER JOBS FOR USE IN DEVELOPING TASK INVENTORIES. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task SAMOFF, Subtask III, Tech. Rep. 65 10, Nov. 1965, 54pp. Human Resources Research Office, George Washington University, Alexandria, Va.

A job description procedure was developed for use by Army service schools in identifying all of the tasks performed by junior officers in a job assignment. This procedure was based on a model of officer job behavior, illustrating the nature and sequence of tasks performed to attain specific goals within each area of responsibility. The behavior model was itself developed from considerations of existing job descriptions, the nature of job information typically provided by interviews with officers, and an information-processing view of purposive behavior. Application of the description technique to one officer job yielded 816 tasks covering troop leadership and unit management, as well as tactical and technical functions. General statements of work were effectively broken into task-level statements of job activities. The technique should provide a practical means for describing most supervisory and command jobs characterized by a high proportion of variable, nonroutine, and covert activities. R 22

26,806

Davis, D.J. AN EXAMINATION OF HUMAN STRATEGIES FOR ACQUIRING INFORMATION. Contract OE 4 20 002 Tech. Rep. 8, Oct. 1965, 42pp. Training Research Lab., University of Illinois, Urbana, Ill.

4 experiments were conducted in which strategies were examined as a function of various environmental factors. In I a question based on dominant characteristics of the stimuli was preferred as long as it was not highly inefficient. In II efficiency generally decreased as skewness of source distribution increased, i.e., Ss tended to ask questions which halved the cards in terms of number rather than probability. In III experience generally led to the development of more efficient strategies, i.e., Ss learned to pay less for each bit of information. In IV a change in approach in I situation was reflected in a change to similar situations. It was thus concluded that 3 main factors influenced the use of strategies: extent to which questions reflected dominant characteristics of the stimuli, average amount of information obtained with questions, and risk of having to use a large number of questions. (HEIAS)

R 18

26,807

McHale, T.J. HOW CONSCIOUS IS TRANSFER OF A SPECIFIC RULE? Contract 4 20 002, Tech. Rep. 6, Aug. 1965, 73pp. Training Research Lab., University of Illinois, Urbana, Ill.

This study is concerned with transfer resulting from the learning of a specific rule or processing formula. In task 1, the rule was learned as applied to 1 set of stimuli; in task 2, the same rule and other alternative rules are potential solutions. The question was-- what are the mechanisms of transfer. A theory composed of transfer hypothesis (TH), transfer intention (TI), and transfer performance was tested by analyzing both trials to criterion, the customary measure, and verbal reports, a measure which would show the influence of prior learning even though it was not successful. 48 Ss were trained with rule 1, 48 with rule 2, and 32 had no relevant pretraining (controls). After 12 consecutive correct answer trials, the transfer task was given during the latter, 1 subgroup in each training rule group was given transfer hints until solution. ANOVA showed rule 1 more difficult (more time to learn) than 2; transfer hint subgroups reported significantly more positive TH & TI (verbal reports) than no-transfer hint Ss; transfer hint subgroups also required significantly fewer trials to criterion. Types of cues used in solution of transfer task varied depending on the training rule learned. The results are considered in detail relative to possible transfer processes. (HEIAS)

R 27

26,808

Koestler, A.G. (Ed.). THE EFFECT ON THE CHIMPANZEE OF RAPID DECOMPRESSION TO A NEAR VACUUM. Contract T 27210G, NASA CR 329, Nov. 1965, 106pp. National Aeronautics & Space Administration, Washington, D.C.

8 chimpanzees, used in 9 separate tests, were decompressed from 179 mm Hg (100% oxygen) to less than 2 mm Hg in 0.8 secs. and remained at this altitude from 5 to 150 secs. After re-compression to 179 mm Hg (again breathing 100% oxygen), the Ss were kept at this altitude for 24 hrs. Performance by all animals, on a complex operant schedule presented during and following rapid decompression, reached a baseline level of performance within a 4 hr. post-decompression period. No central nervous system damage (as measured by behavior) could be detected. Cortical EEG, ECG, and respiration were recorded before, during, and following decompression. Visual analysis of recorded physiological parameters was conducted and correlations with performance were attempted. EEG fast activity (10-12 cps) always preceded the end of the period of total behavioral impairment, while total behavioral recovery followed the return of normal EEG patterns. Surgical procedures for implanting chronic cortical leads were developed. All Ss showed slight neutrophilia, increased transaminase, and facial edema which returned to normal with 72 hrs. after decompression. All Ss survived in good health and no lasting effects of rapid decompression to a near vacuum could be detected.

R 51

26,809

Ratterree, H.B. AN INTRODUCTORY STUDY OF THE NATURE OF CREATIVITY. A SPECIAL PROBLEM REPORT. (M.S. Thesis). Contract AF 33(608) 1063, June 1965, 36pp. Georgia Institute of Technology, Atlanta, Ga. (AD 620341)

An introductory study is made of the nature of creativity. The method utilized is a search of the literature for experimental and historical evidence coupled with personal observation and experience. Areas that are investigated for their relationship to creativity are effort, education, habits or previous experience, and encouragement and discouragement.

R 26

26,810

Kennedy, R.S., Graybiel, A., McDonough, R.C. & Beckwith, F.D. SYMPTOMATOLOGY UNDER STORM CONDITIONS IN THE NORTH ATLANTIC IN CONTROL SUBJECTS AND IN PERSONS WITH BILATERAL LABYRINTHINE DEFECTS. Contract NASA Order R 93, Proj. NRO05.13 6001, Subtask 1, NSAM 928, Rep. 112, May 1965, 10pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

10 labyrinthine defective (L-D) and 20 normal Ss were exposed to extremely severe weather conditions during a sea voyage. The effects of such a stress were complicated by a feeling of fear in all of the normal and in some of the L-D Ss. None of the latter manifested typical symptoms of motion sickness whereas all of the normal Ss did. The fact that the L-D Ss did not become sick suggests that, even in instances where motion sickness symptoms appear to be triggered by anxiety, the vestibular organs play an essential etiological role.

R 15

26,811

Kennedy, R.S. & Graybiel, A. THE DIAL TEST: A STANDARDIZED PROCEDURE FOR THE EXPERIMENTAL PRODUCTION OF CANAL SICKNESS SYMPTOMATOLOGY IN A ROTATING ENVIRONMENT. Contract NASA Order R 93, Proj. MR005.13 6001, Subtask 1, NSAM 930, Rep. 113, June 1965, 25pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

Part 1 describes a developmental study to identify an optimum Dial Test procedure and the results of using the procedure on 3 groups with differing aviation experience. The problem was to determine that combination of rotational velocity of a Slow Rotation Room, time between dial settings, and number of sequences to be performed which would yield the best measure of susceptibility to motion sickness. Parts 2 & 3 report the correlations between Dial Test scores and the Modified Romberg and the Coriolis Illusion, and with scores from a Motion Sickness Questionnaire. Modified Romberg scores had a small but significant relationship with Dial Test scores for the "incoming flight student" group, and this relationship was almost significant for the "proficiency billet aviator" group. Coriolis Illusion scores were not significantly related to Dial Test scores but were in the predicted direction. Statistically significant relationships were obtained between Dial Test score and scores from 2 keys to the Motion Sickness Questionnaire; these need cross-validation, however.

R 26

26,812

Mathis, J.V., Dickerson, T.J., Butler, C. & Mazzilli, F. THE CORRECTIVE MAINTENANCE BURDEN PREDICTION PROCEDURE (PROCEDURAL INSTRUCTIONS). Contract Nonr 3821(00), Rep. ND 65 36, June 1965, 85pp. USN New Developments Research Branch, Bureau of Naval Personnel, Washington, D.C. (Federal Electric Corporation, Paramus, N.J.). (AD 475771)

As a result of the program in which analysts of the Personnel Research Laboratory (PRL), Washington, D.C. were trained in the application of the Corrective Maintenance Burden (CMB) Prediction Procedure, the need for revision of certain areas in the procedural instructions became apparent. Such revision included the updating of reliability data, clarification of some of the instructions, and the addition of procedural steps to simplify the application. The new instructions, which are contained in this report, replace the procedural instructions contained in Volume 11 of Report No. ND64-34, entitled, "PREDICTING THE CORRECTIVE MAINTENANCE BURDEN." (U) The revised procedural instructions are in 2 sections. Section 1 contains the procedural steps for predicting the equipment Corrective Maintenance Burden. Section 2 contains the instructions for utilizing the Corrective Maintenance Burden data to determine any special training, the skill levels, and the applicable rating and rate of electronic maintenance personnel that would be required to perform corrective maintenance.

R 3

26,813

Hyde, A.S. & Raab, H.W. A SUMMARY OF HUMAN TOLERANCE TO PROLONGED ACCELERATION, FINAL REPORT JANUARY 1963-JANUARY 1965. Proj. 7222, AMRL TR 65 36, Feb. 1965, 34pp. USAF Biophysics Lab., Wright-Patterson AFB, Ohio.

Human S tolerance to accelerations of greater than 1 sec. duration is summarized for the orthogonal X, Y, and Z axes. Because each investigator at each laboratory utilizes different restraint systems, body positions, ambient temperatures, etc., and most important, utilizes different criteria of "tolerance," the data are referenced and presented in tables and graphs for each major category (direction) of acceleration. The points presented in the graphs and tables are usually the highest values achieved; in each series there were Ss who could not tolerate the given direction, amplitude, and duration.

R 26

26,814

Hutchins, C.W., Jr. & Kennedy, R.S. THE RELATIONSHIP BETWEEN PAST HISTORY OF MOTION SICKNESS AND ATTRITION FROM FLIGHT TRAINING. BuMed Proj. MR005.13 3003, Subtask 10, NSAM 932, Rep. 8, June 1965, 6pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

The Pensacola Motion Sickness Questionnaire (MSQ) was subjected to an item analysis using successful completion of the flight training program as the criterion for item selection. The scoring key that resulted was cross-validated on a new sample and a statistically significant correlation obtained. When included in the multiple prediction formulae used at this facility to predict training success, the MSQ made significant increases in the multiple validity of the formulae for predicting both successful completion of flight training and voluntary withdrawal from training.

R 9

26,815

Holmstrom, F.M.G. & Beyer, D.H. DECOMPRESSION SICKNESS AND ITS MEDICAL MANAGEMENT. A TEAM APPROACH TO THE STUDY OF AVIATOR'S NEUROCIRCULATORY COLLAPSE. Task 775002, SAM TR 65 21, Jan. 1965, 6pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Military Med., Sept. 1965, 130(9), 872-877).

The USAF School of Aerospace Medicine has established a Decompression Sickness Management Team for the purpose of studying and treating patients with aviator's postdecompression neurocirculatory collapse as it occurs in USAF personnel in the continental United States. To accomplish this purpose the Team provides a consultation service, studies the pathologic physiology of decompression sickness, and seeks to establish and improve therapeutic schedules. This report defines postdecompression neurocirculatory collapse and comments on its incidence in the U.S. Air Force, providing a background against which the mission of the Decompression Sickness Management Team can be examined. The essentials of Team staffing and operational procedures are reviewed. The experience, to date, suggests that compression treatment, in accordance with the U.S. Navy tables for the treatment of decompression sickness and air embolism, produces immediate and demonstrable clinical improvement. Such improvement is not seen in neurocirculatory collapse patients treated symptomatically. Compression to 6 atmospheres is recommended as the treatment of choice for the neurocirculatory collapse of aviator's decompression sickness. Other recommendations in treatment schedules are discussed.

R 27



26,816

Hollinger, J.A. SEPARATION TESTS OF ROCKET-PROPELLED MODELS OF A PILOT-ESCAPE CAPSULE. NASA TN D 2901, July 1965, 51pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

The separation of a jettisonable-nose pilot-escape capsule was investigated by means of rocket-model flight tests. The combination model was propelled to a supersonic Mach number at a low altitude and, while in coasting flight, the capsule was propelled away from the afterbody of the model by 2 small solid-fuel rocket motors. The capsules were instrumented with accelerometers which showed that the accelerations and rotations were within human tolerances in a range of scale factors most likely to include a prototype single-seat aircraft. The model positions were determined from ground-based tracking cameras and onboard recovery cameras. 5 flight tests were conducted, during one of which the combination did not separate. The tests in which separation occurred showed that the separation was smooth with a properly timed sequence and that the capsule must be moved rapidly away from the afterbody to minimize disturbances caused by the afterbody flow field. The afterbody with attached capsule was boosted to supersonic test velocity by a solid-propellant booster rocket in the afterbody. The flights were launched from the NASA Wallops Station.

R 11

26,817

Hewes, D.E. REDUCED GRAVITY SIMULATOR FOR STUDIES OF MAN'S MOBILITY IN SPACE AND ON THE MOON. Report from: Human Factors Meeting, Dayton, Ohio, October 18-21, 1965." Rep. L 4825, 1965, 15pp. Langley Research Center, NASA, Langley Station, Hampton, Va.

3 unique reduced-gravity simulators developed by the Spacecraft Research Branch of the Langley Research Center are briefly described and their principal features discussed. Current research objectives and some typical test results also are outlined. The simplest one is the lunar-walking simulator developed specifically to study man's self-locomotive ability on the moon. The current program is aimed at evaluating performance with and without space suits while carrying various sizes of equipment loads; data thus far indicate the effort involved in lunar activity is significantly less than corresponding earth activity. The rotating space station simulator is being used to evaluate vestibular disturbances from angular motions and various design features relative to ability to move within the station. The lunar landing research facility is being used to evaluate pilot handling-qualities criteria for manned lunar flight vehicles and to determine the effects of various vehicle design and operational factors. (HEIAS)

26,818

Henzel, J.H., Clarke, N.P., Mohr, G.C. & Weis, E.B., Jr. COMPRESSION FRACTURES OF THORACIC VERTEBRAE APPARENTLY RESULTING FROM EXPERIMENTAL IMPACT, A CASE REPORT. FINAL REPORT JANUARY 1964-APRIL 1964. Proj. 7231, Task 723106, AMRL TR 65 134, August, 1965, 8pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

The occurrence of compression deformities of the 4th & 5th thoracic vertebrae in a human test S (DCL) exposed in laboratory experiments to an impact acceleration profile similar to that produced by ejection seat rockets is reported. This injury was presumed to be the result of an impact profile having a peak acceleration of 18.8 G, a rate of onset of 420 G per sec. and a baseline duration of approximately 100 msec. The S's long axis was inclined backward 34° from the vertical force vector. The diagnosis was established upon the S's termination of hazardous duty and separation from the service, approximately 1 year after the presumptive date of injury. This documented injury represents a demonstrable endpoint in impact tolerance of a S exposed to an acceleration environment which can be specifically described.

R 5

26,819

Hartman, B.O., Langdon, D.E. & McKenzie, R.E. A THIRD STUDY ON PERFORMANCE UPON SUDDEN AWAKENING. Task 775504, SAM TR 65 63, August 1965, 4pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

4 Ss served for 5 successive nights in an experiment on performance upon sudden awakening. Ss performed a piloting task for 10 minutes before going to bed, once at night after sudden awakening, and again in the morning after sudden awakening. Proficiency upon sudden awakening was always poorer than presleep performance. Nighttime performance was poorer than upon awakening in the morning, although the difference was not significant. No systematic recovery in proficiency after sudden awakening could be seen. Oral temperatures, GSR monitoring of sleep, and S-E estimates of deep sleep were included in an attempt to identify psychophysiological factors associated with decrements upon sudden awakening. No relationship was seen between time-on-target scores and oral temperatures. However, poorer performance was associated with deeper sleep states prior to awakening.

R 3

26,820

Graybiel, A., Kennedy, R.S., Knoblock, E.C., Guedry, F.E., Jr., et. al. THE EFFECTS OF EXPOSURE TO A ROTATING ENVIRONMENT (10 RPM) ON FOUR AVIATORS FOR A PERIOD OF TWELVE DAYS. Contract NASA R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 923, Rep. 111, March 1965, 67pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

4 carefully selected military personnel undergoing flight training were exposed to constant rotation at a speed of 10 RPM for 12 days in the Pensacola Slow Rotation Room. Environmental and working conditions simulated in many respects those which might obtain in a rotating orbiting spacecraft. The findings are discussed under 3 headings: clinical symptoms, clinical laboratory findings, and psycho-physiological performance. The experiment has demonstrated that countermeasures in addition to adaptation are needed if there is immediate exposure to rotational velocities of 1- RPM and that the rotating room is a useful device for further exploration of vestibular and CNS mechanisms.

R 30

26,821

Graybiel, A. & Fregly, A.R. A NEW QUANTITATIVE ATAXIA TEST BATTERY. Contract NASA Order R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 919, Rep. 107, March 1965, 41pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

A new multi-dimensional quantitative ataxia test battery employing the "rail method" of testing was developed to assess more precisely than heretofore postural equilibrium-disequilibrium under unusual conditions and stresses such as rotating environments. High reliability, including test-retest reliability, was demonstrated for each of 2 versions: a Long Version employing 6 rails of varying widths, and a Short Version employing 2 of these rails. Normative standards covering a wide age range, and age, height, and weight influences upon performance, tentative sex differences in performance, practice effects, and Test Battery relationships with several clinical-type ataxia tests were determined. Validity of the standardized test procedures in the laboratory, in the field, and in clinical situations was demonstrated, and present and future uses of the Test Battery in normals and auricular involved individuals in vestibular research as well as in related research-clinical areas were outlined, and several methodological limitations were indicated.

R 66

26,822

Gillingham, K.K. SOME NOTES ON THE THRESHOLD OF THE VESTIBULAR CORIOLIS EFFECT AND ITS SIGNIFICANCE TO AIRCREW. FINAL REPORT 1 OCTOBER 1964-1 FEBRUARY 1965. Task 775004, SAM TR 65 55, Aug. 1965, 4pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

By employing self-induced Coriolis stimulation, Ss are able to perceive otherwise undetectable constant angular velocity in the yaw plane. How accurately this can be done is studied by determining the psychophysical functions for the discrimination of direction of rotation at different yaw velocities. The results indicate that perceivable Coriolis effects can be generated by constant angular velocities of  $<1^\circ/\text{sec}$ . This means that: a) spatial disorientation due to the Coriolis effect can occur at very slow turn rates in instrument flying; and b) that pilots' head-shaking maneuvers may be an appropriate means of countering some forms of spatial disorientation.

R 17

26,823

Gernandt, B.E., Igarashi, M. & Ades, H.W. EFFECTS OF PROLONGED CALORIC STIMULATION UPON OCULOMOTOR, VESTIBULOSPINAL, AND SEGMENTAL SPINAL ACTIVITY. Contract NASA R 93, BuMed Proj. MR005.13 2005, Subtask 4, NSAM 934, Rep. 3, June 1965, 16pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

The effects of prolonged caloric stimulation with hot ( $45^\circ\text{C}$ ) or ice water have been studied upon eye movements, vestibulospinal, and segmental spinal activity. The results obtained under this variety of test conditions demonstrate that continuous irrigation with water of extreme temperature evokes, in addition to the effects upon the position of the cupula by endolymphatic convection currents according to the theory of Bárány, an initial excitatory thermal effect giving rise to an increased afferent firing which is followed by a paralyzing effect upon the vestibular sensori-neural structures. In order to localize more specifically the site of action of thermal stimulation, experiments were carried out upon labyrinthectomized squirrel monkeys and monkeys with the 3 semicircular canals plugged. These results, and those obtained by recording the cochlear microphonic and neural components to click stimulation during maximal cold and warm irrigation of the ear, indicate that the effect is upon the peripheral nerve fibers somewhere along their course from the ampulla to the internal auditory meatus. Earlier theories which have predicted this direct effect on the nerves are mentioned, but, for the present, without comment as to their respective importance in explaining paradoxical caloric reactions.

R 32

26,824

Gazenko, O.G. & Gyurdzhian, A.A. PHYSIOLOGICAL EFFECTS OF GRAVITATION. Report from: "Eighth Plenary Meeting & Sixth International Space Science Symposium, Buenos Aires, Argentina, South America, May 10-21, 1965." NASA TT F 376, Aug. 1965, 21pp. National Aeronautics & Space Administration, Washington, D.C.

The direct influence of weightlessness as a mechanical factor on the course of physiological processes is probably not of great significance. The primary effects are changes in the receptor functions and in the afferent sphere. The heightened afferent activity leads to: general nonspecific stress; impairment of perception, which gives rise to illusions such as spatial disorientation; inadequate reactions by the viscera, disruption of self-regulation and coordination of autonomic functions; impairment of coordination of movements and decrease in operational efficiency. After the shift to weightlessness the following compensatory mechanisms are activated: mechanisms of nonspecific adaptation; reconstitution in the afferent sphere through the higher divisions of the CNS, the cerebral cortex in particular; reconstitution in regulation of activity of the viscera; reconstitution in the sphere of somatic functions, again with extensive participation of the higher divisions of the CNS. These effects were measured and reported by the Russian cosmonauts. (HEIAS)

R 60

26,825

Gazenko, O.G., Parin, V.V., Chernigovskiy, V.N. & Yazdovskiy, V.I. SPACE PHYSIOLOGY, SOME RESULTS AND PROSPECTS OF EXPERIMENTAL INVESTIGATIONS. Report from: "Tenth Congress of the I.P. Pavlov All Union Physiological Society, Yerevan, Russia, October 22-28, 1964." NASA TT F 305, March 1965, 17pp. National Aeronautics & Space Administration, Washington, D.C.

The authors describe the results of telemetric investigations carried out during suborbital flights in space. Studies of animals during suborbital flights in 1957-1959 showed that excess gravity in dogs was associated with changes in the cardiovascular and respiratory systems. An active or passive defense reaction developed. Later, under conditions of weightlessness, these indices approximated prelaunch levels. Experiments in 1960-1961 which involved the study of various specimens, including animals, plants, microorganisms and biochemical substrates, during flight and after their return to earth confirmed the results of earlier tests. Stability of these physiological parameters developed after some time under conditions of weightlessness, although the cardiovascular and respiratory systems showed some retardation in centrifuge studies. There was some instability in the cardiac rhythm. Animals functioned with little energy and some disruption of physiological and biochemical parameters occurred. It was concluded however, that space flight does not have any unfavorable biological effects on man or animals. In 1961, Yu. A. Gagarin completed 1 orbit without any negative consequences. In 1961, G.S. Titov completed a 1-day orbital flight without any ill effects other than an unpleasant sensation of rolling. Effects of long-term weightlessness and the environmental requirements of extended space flight were studied during the flight of cosmonauts Nikolayev & Popovich. Although there were some irregularities in heart action and some fatigue and irritation after the flight, no pathological indications were found. The last flight, that of V.F. Bykovskiy & V.V. Tereshkova, made it possible to compare the reactions of the female and male organism. The results again indicated a gradual adaptation to the conditions of flight, although some symptoms of general fatigue were observed.

26,826

Fregly, A.R. & Kennedy, R.S. COMPARATIVE EFFECTS OF PROLONGED ROTATION AT 10 RPM ON POSTURAL EQUILIBRIUM IN VESTIBULAR NORMAL AND VESTIBULAR DEFECTIVE HUMAN SUBJECTS. Contract NASA Order R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 920, Rep. 108, March 1965, 24pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (Aerospace Med., Dec. 1965, 36(12), 1160-1167). (AD 617754)

As a means of better understanding the role of the vestibular organs in relation to ataxic responses to prolonged rotation, 2 contrasting groups of Ss were utilized to: a) determine quantitatively to what extent two visually-enhanced postural equilibrium test performances of labyrinthine defective Ss (L-D's) on a single rail of optimum difficulty become disturbed along the time axis of rotation (Experiment A), and b) compare the performances of these L-D Ss with those of normal Ss in terms of postrotation effects as studied with a new standardized ataxia test battery (Experiment B). Rotation-induced ataxia was superimposed to an appreciable extent upon the previously present and characteristic vestibular ataxia in the L-D's (Exp. A), and upon cessation of rotation (Exp. B), there were significant decrements on all Test Battery performances of the normal group, whereas in the L-D group significant decrements were observed only on the 2 visually-enhanced tests. Other findings, which were considered tentative, are discussed in terms of several unresolved methodological problems in such experiments.

R 24

26,827

Fregly, A.R. & Graybiel, A. RESIDUAL EFFECTS OF STORM CONDITIONS AT SEA UPON THE POSTURAL EQUILIBRIUM FUNCTIONING OF VESTIBULAR NORMAL AND VESTIBULAR DEFECTIVE HUMAN SUBJECTS. Contract NASA Order R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 935, Rep. 115, July 1965, 14pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

The residual effects of storm conditions at sea upon postural equilibrium functioning have not been studied objectively. As part of a larger study, the opportunity was taken to investigate by means of a new quantitative ataxia test battery differences between vestibular normals (N = 20) and labyrinthine defective (L-D) human Ss (N = 9). Following a highly stressful sea experience, during which bizarre stimulation of the vestibular apparatus was amply provided, the L-D group maintained or improved their baseline postural equilibrium test performance scores. The 10 initially poorest scoring normals as a sub-group were found free of postural decrement in contrast with significant performance decrements observed in the initially highest scoring sub-group of normals. Probable influences over differential results within the normals and between groups as well as differential test findings are discussed.

R 20

26,828

Frankenhaeuser, Marianne, Froberg, Jan & Mellis, Inga. SUBJECTIVE AND PHYSIOLOGICAL REACTIONS INDUCED BY ELECTRICAL SHOCKS OF VARYING INTENSITY. Number 182, Feb. 1965, 8pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

Effects of A.C. current of different intensities applied at irregular intervals to 2 fingers of one hand during 5 separate sessions were studied in 15 Ss. The intensities ranged between 2 and 8 times the individual sensation thresholds. In line with the assumptions made, increases in shock intensity were accompanied by increased unpleasantness (measured by the method of magnitude estimation), increased adrenaline excretion, and decreased tissue resistance. Furthermore, unpleasantness was a positively accelerated function of adrenaline excretion and tissue resistance. Intervals between stimuli were made very irregular (3 to 90 sec.) to enhance effects of anticipation. This design does not permit a differentiation between effects of anticipation and of stimulation. It seems very likely that the control condition, which was similar to the other sessions except for the absence of shocks, also involved some elements of stress. Regardless of the relative roles played by anticipation and stimulation, the effects were, on the whole, only slight to moderate.

R 11

26,829

Fernstrom, R.W. Jr., Gschwind, R.T. & Horley, G.L. CROSS-COUNTRY SPEED AND DRIVER VIBRATION-AL ENVIRONMENT OF THE M60 MAIN BATTLE TANK. AMCMS Code 5543.12.282.08.06, Tech. Memo 7 65, July 1965, 43pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This study investigated the g environment encountered by M60 tank drivers. It was conducted in 2 phases. In Phase I, the Ss drove an M60 tank over standard courses at constant speed. This phase examined the repeatability of measuring g loads when different drivers were subjected to the same environment. In Phase II, the Ss drove over 2 types of cross-country courses. This phase determined the maximum g load the drivers would accept. The results of the first phase, although incomplete due to excessive recording noise and intermittent channels, show that all Ss' bodies responded to g environments, especially vertical gs, in about the same way. The results of the second phase indicate that Ss had widely differing RMSg and amplitude distributions. Also, average vehicle speeds varied greatly from one course to another. RMSg and vehicle speed were correlated for each channel, to find out whether differing average speeds could account for variations in RMSg level that the Ss experienced. This analysis showed that the average correlation was low ( $r = 0.60$ ) for both transverse and longitudinal channels. The vertical-channel correlations for both vehicle and driver were high ( $r = 0.95$ ). The linear-regression technique (RMSg on speed) was then used to obtain mathematical expressions describing the relationship for each course. The computed expressions are given in this report.

26,830

Dost, F.N., Reed, D.J. & Wang, C.H. EXPOSURES OF BIOLOGICAL SYSTEMS TO INORGANIC FLUORIDE OXIDIZING AGENTS. VOLUME I. HANDLING AND EXPOSURE TECHNIQUES. FINAL REPORT, 1 JULY 1964-30 JUNE 1965. Contract AF 33(615) 1799, Proj. 6302, Task 630202, AMRL TR 65 223, Dec. 1965, 25pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Radiation Center, Oregon State University, Corvallis, Ore.).

A system adaptable for diluting and distributing various inorganic fluoride oxidizing agents has been developed. Known dilutions of these agents in nitrogen or air are generated on the basis of flow rate ratios between undiluted gas and various diluent gases, and confirmed chemically. This report is concerned principally with development of techniques for manipulating inorganic fluoride gases ( $\text{NF}_3$ ,  $\text{N}_2\text{F}_4$ ,  $\text{ClF}_3$ ,  $\text{BrF}_5$ , &  $\text{OF}_2$ ) so that their effects upon and their incorporation into various species of animals, plants and microorganisms may be studied. Problems of materials compatibility, personnel protection, stability of the agents and exposure system design are discussed.

R 6

26,831

Doll, R.E. DECOMPRESSION SICKNESS AMONG U.S. NAVY OPERATIONAL DIVERS: AN ESTIMATE OF INCIDENCE USING AIR DECOMPRESSION TABLES. Proj. SF 011 06 01, Task 3361, Subtask 9, Res. Rep. 4 64, Feb. 1965, 10pp. USN Experimental Diving Unit, Bureau of Ships, Washington, D.C. (AD 612740)

A "liberal" estimate of the incidence of decompression sickness in U.S. Navy operational diving was computed for years 1958, 1960 & 1961. A comparison was made between the incidence using the old U.S. Navy air decompression tables (1958) and the revised U.S. Navy air decompression tables (1960, 1961). Incidences were also computed for dives equal to or greater than 100 ft and less than 100 ft. Findings revealed that for the 3 yrs. a total of 7625 dives were made resulting in 62 reported cases of decompression sickness for an incidence of 0.81%. Incidence for the old tables was 1.10% vs 0.69% for the revised tables. Comparatively few dives of less than 100 ft required decompression; however, a somewhat higher incidence was found for these dives using the revised tables. The author gives a possible explanation for this apparent paradox. As a by-product of this study an incidence of 0.83% was noted when the U.S. Navy helium decompression tables were required.

R 8

26,832

Dolkas, C.B. & Stewart, J.D. EFFECT OF COMBINED LINEAR AND OSCILLATORY ACCELERATION ON PILOT ATTITUDE-CONTROL CAPABILITIES. NASA TN D 2710, March 1965, 39pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

Data are presented to show the effects of superimposing vibration at 11 cps on steady linear acceleration on the tracking ability of a human pilot in a stability- and rate-augmented vehicle with dynamics typical of a large high-thrust rocket. The linear accelerations ranged from 1 to 3.5 g and the oscillatory stresses varied from 0 to  $\pm 3.0$  g at 11 cps. A random-appearing compensatory tracking problem was presented to the pilot in the pitch plane, although the pilot controlled both pitch and yaw. No attempt was made in this study to simulate additional pilot tasks such as monitoring of critical launch vehicle and spacecraft performance and status displays which would be required in the real situation. Various damper-failure situations were investigated, and certain characteristics due to autopilot nonlinearities were studied. Effects on the tracking efficiency of dividing the pilot's attention between pitch and yaw channels were also examined.

26,833

Clarke, N.P., Taub, H., Scherer, H.F., Temple, W.E., et al. PRELIMINARY STUDY OF DIAL READING PERFORMANCE DURING SUSTAINED ACCELERATION AND VIBRATION. FINAL REPORT MARCH-AUGUST 1963. Contract AF 33(657) 11729, Proj. 7231, Task 723101, NASA Defense PR R 58, AMRL TR 65 110, Aug. 1965, 12pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (AD 622298)

Booster induced spacecraft vibrations occur in combination with booster induced sustained acceleration. This was a joint NASA-AF study to provide a preliminary cursory evaluation of the effects of this environment on crewmen. 6 Ss were used in 60 tests to measure the decrement in dial reading ability as a function of the level of 11 cps  $g_x$  vibration and the size of the dial, where a bias acceleration of  $3.85 G_x$  was superimposed on the vibration. Dial reading errors were inversely related to the arc length of the interval between dials and directly related to the amplitude of vibration. There was approximately 50% distortion of the 11 cps vibration acceleration, which markedly influences the interpretation of results and their comparison to measurements of visual decrements from 11 cps vibrations with 1G bias loads. In most general terms, however, the  $3.85 G_x$  bias, and/or the unidirectional force (i.e., the resultant acceleration was always greater than 0 G) creates a subjectively more tolerable environment than with a 1 G bias. Vibrations of  $3.85 G_x \pm 3.0 G_x$  were without serious subjective effects in exposures of 90 sec duration. Gross comparisons of dial reading performance under the 2 conditions provide some indication that the greater bias acceleration is associated with less visual decrement.

R 8

26,834

Clarke, N.P., Mohr, G.C., Brinkley, J.W., Henzel, J.H., et al. EVALUATION OF PEAK VS. RMS ACCELERATION IN PERIODIC LOW FREQUENCY VIBRATION EXPOSURES. Aerospace Med., Nov. 1965, 36 (11), 1083-1089. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Subjects were exposed to vibrations with varying peak and RMS accelerations and frequencies to explore the relative importance of these parameters in determining the effect of the vibration produced by turbulence in low altitude high speed flight. For various RMS acceleration levels and frequency contents, pairs of periodic vibration exposures having the same RMS but different peak accelerations were evaluated using both a subjective severity rating and a measure of vibration induced hand motion. The higher peak acceleration of the various pairs having the same RMS values was subjectively rated more severe in 32 of 40 observations. However, when attempting to hold the hand in a fixed position during vibration, the induced deviations from the null point, expressed either as average or peak-to-peak errors appeared to depend more on RMS acceleration and frequency than on the small differences in peak acceleration studied here.

R 6

26,835

Clark, B. & Graybiel, A. PERCEPTION OF THE VISUAL HORIZONTAL IN NORMAL AND LABYRINTHINE DEFECTIVE SUBJECTS DURING PROLONGED ROTATION. Contract NASA Order R 93, BuMed Proj. MR005.13 6001, Subtask 1, NSAM 936, Rep. 116, July 1965, 7pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

5 normal and 9 labyrinthine defective men were studied in a Slow Rotation Room which produced a change in resultant force of 20° on them. The men faced in the direction of rotation and at 1 min. intervals set a luminous line to the perceived horizontal in darkness for 1 hr. The results for the normal men confirmed an earlier study showing no systematic change in the perception of the visual horizontal after an initial lag effect. In contrast, the labyrinthine defective men showed a smaller, rapid, and then a gradual change in the perception of the visual horizontal throughout the 1 hr. of constant rotation. At the end of 1 hr. there was no significant difference between the 2 groups. These results are discussed in terms of a differential weighting of the synergistic information available to the 2 groups.

R 13

26,836

Chkhaidze, L.V. COORDINATION OF MAN'S VOLUNTARY MOVEMENTS UNDER SPACE FLIGHT CONDITIONS. NASA TT F 355, Aug. 1965, 115pp. National Aeronautics & Space Administration, Washington, D.C. (Transl. from: Izdatel'stvo "Nauka," Moscow, 1965).

The author presents the problems encountered in movement coordination of man in a changed gravitational field, such as will be experienced in space flights. Simulation of inertial forces occurring in accelerations, as well as flights of manned artificial earth satellites, made it possible to establish the experimental conditions for solving these problems. The author believes that voluntary movements in man and higher animals may be regarded as a process consisting of 2 cycles: external, based on external afferentation, and internal - based on internal afferentation. Coordination of human voluntary movements is impaired when the gravitational field increases. The limits of the impairment depend on the state and training of the individual in this field. However, due to the properties of the central nervous system, reinforced by proper advance training, the coordination will return to a specific norm. The human being's capacity to restore movement coordination by systematically performing a skill under overload conditions can form the future basis for the cosmonaut's physical training. The problem of movement coordination in a gravitational field which increases over a very long period of time requires further study.

R 96

26,837

Browning, L.E. & Saylor, W.L. RADIOACTIVE CONTAMINATION OF FIELD CLOTHING - THE BETA HAZARD. Proj. 1N022601A089, Subtask 04 02, NDL SP 4, Jan. 1965, 36pp. USA Nuclear Defense Lab., Edgewood Arsenal, Md. (USAF Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.). (AD 461272)

This study was undertaken to evaluate the beta radiation hazard that would result from radioactive contamination of fatigue and field clothing. Human volunteers and a radioactive fallout simulant were used to conduct the experiment. The volunteers wore fatigue and field clothing and were required to crawl through a muddy field that had been spread with a fine sand contaminated with lanthanum 140. The beta radiation dose to selected body sites was measured, the effectiveness of simple decontamination in reducing the beta injury hazard was evaluated, and quantitative estimates for degree of protection afforded by such clothing from the beta component of a fallout field were developed. The following were among the conclusions drawn: a) for a crawl through a wet fallout field, the surface density of radioactivity retained by the clothing approximated that deposited on the ground; b) when contamination of the skin occurred, the distribution of radioactivity over the skin was highly nonuniform; c) whatever the degree of contamination retained on the clothing, performance of a simple decontamination by the individual significantly reduced the beta burn hazard; d) the average maximum beta energy and the corresponding mean beta energy of radioactive fallout decreases with the age of the fallout field; therefore, the depth dose in tissue decreases with the age of the fallout field.

R 22

26,838

Boreva, L.I. & Zavadovshaya, E.M. BIBLIOGRAPHIC INDEX TO LITERATURE ON AEROSPACE MEDICINE AND BIOASTRONAUTICS PUBLISHED IN THE USSR (1962-1964). Report from: "15th International Astronautical Congress, Warsaw, Poland, 7-12 September, 1964." NASA TT F 270, May 1965, 65pp. National Aeronautics & Space Administration, Washington, D.C.

This 393 item bibliography includes the basic scientific publications in the areas of aerospace medicine and bioastronautics published in the USSR from 1962 to 1964. The bibliography is organized into 3 sections, 1962, 1963 & 1964. The items in each section are ordered under the following subheadings: a) General problems of space biology & aerospace medicine; b) Experimental investigations on spacecraft, satellites, high altitude geophysical rockets and aircraft; c) Results of laboratory investigations with simulation of the effects of space flight factors. An author index is included. (HEIAS)

26,839

Benson, R.W. EXPERIMENTAL BONE AND TISSUE VIBRATOR ASSEMBLY. FINAL REPORT JUNE 1963-AUGUST 1964. Contract AF 33 (657) 11335, Proj. 7231, Task 723103, AMRL TR 65 11, April 1965, 22pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Robert W. Benson & Associates, Incorporated, Nashville, Tenn.).

The measurement of sensitivity of hearing caused by the introduction of vibratory motion into the skull and body has been limited by the nonavailability of an adequate range of suitably controlled excitation. This report describes a special purpose laboratory vibrator which has been developed for use in experimental investigations of hearing by bone and tissue conduction and of mechanical driving point impedance of tissue and bone. The vibrator assembly is floated on an air bearing to provide resonance-free operation over the frequency range of 100-10,000 cps and at intensity levels of 60 decibels above threshold of hearing. Special sensors within the unit provide measurement of the tip velocity of the alternating pressure transmitted by the head and the force due to an external load. Design features and calibration procedures are discussed in this report.

26,840

Andreyev, V. MEDICAL AND PSYCHOLOGICAL PROBLEMS IN LONG SPACE FLIGHTS. JPRS: 29,211, TT: 65 30551, March 1965, 6pp. US Joint Publications Research Service, Washington, D.C. (Transl: Krasnaya zvezda (Red Star), Moscow, Dec. 1964, 3-7).

This narrative article describes some of the problems that will have to be dealt with before man engages in interplanetary flight--enormous speed as this relates to means of controlling the space ship, prolonged weightlessness and its mental and physiological effects, sensory monotony or deprivation and the ability to work. (HEIAS)

26,841

Akulonichev, I.T. & Bayevskiy, R.M. EVALUATING THE STATE AND ACTIVITY OF CREW MEMBERS UNDER CONDITIONS OF PROLONGED SPACE FLIGHT. Report from: "Fifteenth International Astronautical Congress, Warsaw, Poland, September 7-12, 1964." NASA TT F 271, Jan. 1965, 8pp. National Aeronautics & Space Administration, Washington, D.C.

This general article discusses the problems confronting space medicine in studying the effects of extended space flights. Some new methods for physiological investigations are indicated, e.g., the analysis of fine coordination movements in handwriting, the use of programmed examination whereby instruments and pickups are switched on only at certain times during preassigned tests or tasks. The methods used to collect and process physiological information include: direct and indirect telemetry, radiotelephone and telegraph communication, simplex and duplex space TV, memory devices, and specialized electronic computers. (HEIAS)

26,842

Hubner, J. & Seltz, R.H. COCKPIT ACOUSTICAL NOISE SURVEY AND EVALUATION OF PROPOSALS TO REDUCE COCKPIT NOISE IN THE F-4 AIRPLANE. FINAL REPORT. Weptask RA1200001, Prob. FA 251 367, NATC Tech. Rep. ST35 38R 65, May 1965, 27pp. USN Air Test Center, NAS, Patuxent River, Md. (AD 464516)

The noise levels in the F-4 cockpit recorded during 15 flights were undesirably high, but did not degrade the service suitability of the weapon system. The increase in noise level associated with operation of the defog system interfered with communications and caused crew discomfort. Incorporation of the pressurization system modification recommended by VF-121 and modifying the defog air supply valve provided desirable reductions in the noise level and are recommended. The high level of background noise in the interphone system detracted from the flight safety and hampered the operational capability of the F-4. Dynamic microphones minimized the undesirable background noise in the interphone system and are recommended for use in the F-4 airplane.

R 11

26,843

Hill, J.W. & Chisum, Gloria T. FLASHBLINDNESS PROTECTION: THE EYE PATCH. Proj. Weptask RAE 13J 012/2021/R005 01 001, Prob. Assign. 012 AE 13 12, NADC ML 6326, May 1965, 21pp. USN Aviation Medical Acceleration Lab., NADC, Johnsville, Penn. (AD 464192)

The adaptation level of 1 eye can be varied independently of the other so that exposure of 1 eye to a high luminance will leave the adaptation level of the other unchanged. Because of this capacity, the use of an eye patch to cover 1 eye has been proposed as a flashblindness protection device. In the event of an unanticipated nuclear detonation, the eye covered with a patch would be protected against the flash while the exposed eye might well be functionally blinded. Removal of the patch then would allow the use of the protected eye. 2 experiments were conducted to evaluate the effectiveness of a simple eyepatch as a flashblindness protective device and to provide an indication of the desirability of using large numbers of Os in flashblindness research. The results indicate that a simple eye patch does provide some protection from flashblindness and that a completely light tight seal is not necessary for this device to be effective. Because of the noxious nature of the stimulus, the general applicability and significance of data collected from large numbers of Os is questionable. The results of unsophisticated and, presumably, relatively unmotivated Os are at variance with those of more sophisticated Os. It was concluded that: a) the eye patch under consideration in this study adequately protected the covered eye; b) the fit of the eye patch to the contours of the face needs not be completely light tight in order to provide adequate protection for the covered eye.

R 2

26,844

Smid, M. DESIGNING A WORKING PLACE FOR WOMEN FROM AN ANTHROPOMETRIC VIEWPOINT. FSTC 381 T64 236, May 1965, 4pp. USA Foreign Science & Technology Center, Washington, D.C. (Transl. from: Strojirenska Vyroba (Czechoslovakia), 1965, 13(2), 82-84). (AD 462934)

From a group of 408 women, ranging in age from below 18 to 55 yrs., a number of anthropometric measurements relative to work place were obtained. Some of these include: body height, eye level, shoulder level, elbow level, knee level, spread of extended arms, length of extended arm, length of bent forearm, body height above seat, elbow level above seat, level of thigh sitting, length and width of sole and hand. Comparable data from other published sources also are tabulated. (HEIAS)

R 12

26,845

Lucas, R.L., Bell, W.J. & Kreul, E.J. COMMUNICATION WITHOUT CONVENTIONAL (ELECTRO-MECHANICAL) ACOUSTIC TRANSDUCERS. Contract AF 33(615) 2211, Proj. 4335, Task 433506, AFAL TR 65 183, June 1965, 68pp. USAF Avionics Lab., Research & Technology Div., Wright-Patterson AFB, Ohio. (Santa Rita Technology, Incorporated, Menlo Park, Calif). (AD 467126)

A tactile transducer provided stimulation composed of pulses of 1 msec duration programmed in regular and irregular sequences. The elicited sensations were compatible with the sensations of speech production. Sensations resembling vowels, fricatives, stops, etc., were readily learned because of their ease of association with already learned speech data. Subjective tests of this tactile communication indicated steep rates of learning and good retentivity. When appropriate phoneme-like sensations and silences were transmitted at about 3 frames/sec., the illusion of words was experienced which separated the communication from being simply a series of coded stimuli. This word-like, or Gestalt sensation is expected to increase in prominence as the tactile frame-rate is increased up to 10 frames/sec. Real-time speech-taction is anticipated as a future reality through use of an electrical analog of the human ear which would transduce speech to the tactile sensations already found to provide speech-like communication.

R 174

26,846

Durand, T.S. THEORY AND SIMULATION OF PILOTED LONGITUDINAL CONTROL IN CARRIER APPROACH. FINAL REPORT. Contract N0W 62 0977 c, STI Tech. Rep. 130 1, March 1965, 76pp. Systems Technology, Incorporated, Hawthorne, Calif. (AD 464703)

Analyses and experiments were performed to determine the causes of the pilot's "inability to control altitude," which is often described as the reason for a (minimum) limiting usable carrier approach airspeed. The analyses indicate that an altitude tracking performance defect is encountered at a certain speed assuming the pilot controls the pitch attitude with elevator and altitude with throttle. The speed at which this theoretical "problem" is encountered seems to match well with flight test determined minimum carrier approach speeds for several aircraft. Thus the cause/effect relationship is clearly inferred. However, there is then considerable question as to why alternative piloting techniques which eliminate the "problem" are not used. To investigate such inferences and questions and to lend credence to the analyses, piloted simulation experiments were devised, implemented, and run. 5 pilots rated 34 different airframe configurations, each simulating flight characteristics either above or below predicted minimum speeds. These ratings confirm the usefulness of an analytically determined "reversal parameter" for predicting the pilot-selected minimum approach speed. Results are also described of tests on modified airframe and display characteristics aimed at improving system performance.

R 21

26,847

USCG Testing & Development Center. USEFUL CHARACTERISTICS FOR MARITIME AIDS-TO-NAVIGATION LIGHTS. Proj. H2 2, Rep. 411, April 1965, 39pp. USCG Field Testing & Development Center, Baltimore, Md. (AD 468004)

There has been much discussion as to the most useful characteristics for maritime aids-to-navigation lights. A study of the mariner's ability to take bearings on flashing lights is reported. By correlating the results of this study with information already available concerning the efficiency and conspicuity of flashing lights, conclusions are reached regarding the most useful characteristics for aids-to-navigation lights.

R 14

26,848

Lindenlaub, J.C. & Mix, D.F. LEARNING THEORY APPLIED TO COMMUNICATIONS. FINAL REPORT, 1 MARCH-1 SEPTEMBER 1965. Contract AF33(615) 2620, Proj. 4335, Task 433529, TR EE 65 20, AFAL TR 65 273, Oct. 1965, 128pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Electrical Engineering School, Purdue University, Lafayette, Ind.). (AD 474097)

The problem of communicating through unknown and/or time varying media is investigated from both an experimental and theoretical viewpoint. Computer simulation using Monte-Carlo techniques is used to experimentally compare the convergence rates of 5 learning systems in both single threshold (fixed sample size hypothesis test) and 2 threshold (Wald's sequential analysis) binary decision making models. These 5 systems are With Teacher, Decision Directed Measurements (DDM), Exponential, Sub-Optimum Iterative, and Simplified Iterative, the last of which is new with this work. In both types of models, the mean values of both populations (for the binary case) are assumed unknown, and the "learning" is associated with improving performance as these unknown means are estimated. Methods of improving performance while communicating through time varying media are investigated by considering the mean values to be time varying rather than fixed parameters. Various weighting functions are investigated, including Wiener-Hopf filtering and recursive filtering. The problem of applying learning theory to general communication systems is considered, and the difficulties encountered are discussed.

R 20

26,849

Abraham, E.L. (Chm.). MINUTES OF THE AIR FORCE (PROTECTIVE AND SURVIVAL) PERSONAL EQUIPMENT ADVISORY GROUP. Report from: "Personal Equipment Advisory Group Meeting, 18-20 May 1965, Colorado Springs, Colorado." May 1965, 63pp. USAF Middletown Air Materiel Area, Olmsted AFB, Penn. (AD 464885)

These minutes describe the stage of progress in the development and evaluation of numerous items of personal equipment and point up major problem areas affecting their completion. The equipments include survival kit components, signal flares, eye protective devices, protective clothing, life raft and accessories, personal locator beacon, ear cushions, and lap belts. (HEIAS)

26,850

Martin, T.B., Nelson, A.L. & Zadell, H.J. SPEECH RECOGNITION BY FEATURE ABSTRACTION TECHNIQUES. FINAL REPORT JULY 1964-SEPTEMBER 1965. Contract AF 33(657) 11535, Proj. 4335, Task 433521, AFAL TR 65 317, Dec. 1965, 121pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Radio Corporation of America, Camden, N.J.). (AD 476317)

This report describes the application of feature abstraction techniques to acoustic recognition of speech. This work is part of a continuing study to demonstrate the ultimate feasibility of the recognition of continuous speech using feature abstraction techniques. In the present contract, major emphasis was placed on the recognition of 28 phonemes in discrete speech for 6 male talkers. These 28 phonemes consisted of the 10 simple vowels, 6 vowel-like consonants, 6 fricative consonants and 6 stop consonants. A total of 2160 consonant-vowel-consonant utterances were used for the statistical analysis and tabulation of recognition scores. The results presented in the report indicate that very accurate machine recognition of discrete speech can be achieved. The feasibility of accomplishing this recognition for isolated speech provides a basis for extending the feature abstraction technique to continuous speech.

R 2

26,851

Ramsey, R. (Proj. Dir.). SPECIALIZED ACOUSTIC TRANSDUCERS. Contract AF33(615) 1295, Proj. 4335, Task 433506, AFAL TR 65 131, June 1965, 58pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Electro-Voice, Incorporated, Buchanan, Mich.). (AD 466350)

The design requirements for acoustic transducers used in space applications are derived from considerations of environment, comfort, and intelligibility. The important requirements include the need for acoustic noise attenuation at the ear, operation at reduced ambient air pressure, and the requirement for small size and light weight. The effects of interference and associated electronic equipment upon the transducer designs are discussed and the following recommendations made: in-line microphone amplifiers should be used where control of cable placement is in doubt; and, a microphone impedance of 100 to 150 ohms should be used. A description of the development and test of an experimental headset designed to meet these requirements is included. A microphone and earphone of entirely new design form a part of the headset. The utilization of a new magnetic material, Alnico IX, and the use of cellular plastic material in the earphone hardshell are among the new concepts used in these designs. Both the microphone and earphone design have been tailored to the requirements of space flight and represent significant size and weight reductions.

R 22

26,852

Garvin, L.E. & Foley, M.E. THE COMPILATION OF REPRESENTATIVE SENSOR IMAGERY. FINAL REPORT. Contract AF30(602) 3136, Proj. 665A, RADC TR 64 455, Rep. FR 105 2, April 1965, 51pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Autometric/Raytheon Company, Alexandria, Va.). (AD 465436)

This summary report reviews the studies accomplished, with their conclusions and recommendations. The tasks of film-processing, plotting, evaluation, and target analysis are described in detail, and specific instructions and procedures relative to their handling are presented. An up-to-date target list is also included. Procedures for extracting image truth from multi-sensor imagery are presented in detail.

R 2

26,853

Smith, T.L., Zieger, L. & DuBois, A.B. EFFECT OF SCOPOLAMINE ON RESPIRATION. PROGRESS REPORT, JUNE 1, 1964-MAY 31, 1965, PART I. Contract DA 18 108 AMC 143 (A), ca. 1965, 7pp. USA Chemical Center, Edgewood Arsenal, Md. (Physiology Dept., University of Pennsylvania, Philadelphia, Penn.). (AD 466322)

The effect of scopolamine hydrobromide (Wellcome), 0.5 mg. injected intramuscularly, was compared with atropine sulfate, 0.5 mg., and morphine sulfate, 10 mg., in 10 Ss. There was no effect on vital capacity, oxygen consumption, minute volume of ventilation, or end-tidal CO<sub>2</sub> tension. Physiological dead space, determined using the Bohr formula (end-tidal CO<sub>2</sub> tension, mixed expired CO<sub>2</sub> tension, and tidal volume) increased with all 3 drugs.

26,854

Northrop Space Laboratories. COLLECTED DATA ON 48 ROCKET SLED EXPERIMENTS (HOLLOMAN AIR FORCE BASE). Contract AF41 (609) 2317, Rep. NSL 65 94, May 1965, 123pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Northrop Space Laboratories, Hawthorne, Calif.). (AD 465596)

The purpose of this interim report is to complete the basic documentation of 77 experimental rocket sled runs conducted during the period 1954 to 1958. The objective of the program was to study the effects of acceleration and windblast stresses on living Ss and to assist in the development and evaluation of protective equipment to mitigate adverse effects of accidental exposure to such stresses. The range of test conditions and objectives covered in this report is wider than in any 1 of the previous reports. New aspects discussed herein include: a) sudden exposure of Ss to high velocity windblast, at or near maximum sled velocity, using a quick-opening windshield, in 2 test situations: in a forward-facing, fixed seat; and in a forward-rotating, "tumbling" seat. Both of the foregoing being combined with linear deceleration (-G<sub>x</sub>); b) effects on forward-facing, seated chimpanzee Ss of combined horizontal and vertical deceleration (-G<sub>z</sub> with +G<sub>z</sub>) as might be experienced in an aircraft crash landing. In the deceleration experiments, attempts were made to obtain adequate and reliable information from sensors on living Ss, so as to advance understanding of dynamic response factors. This was only partially successful, due to the state-of-the-art limitations in bioinstrumentation and in data telemetry from a high-velocity ground vehicle at that period (1954 to 1958). Even the accurate measurement of rocket sled deceleration with a high degree of time resolution proved more difficult than anticipated. In spite of these limitations, the experiments produced a wealth of information contributing to better understanding of human and test animal tolerance to high biodynamic stress and pointed out promising lines of restraint system and protective equipment development.



26,855

Hamilton, J.E. EFFECT OF LUMINANCE ON THE MOON ILLUSION. Task 630103, SAM TR 65 72, Oct. 1965, 9pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 474456)

An investigation was made to determine if the moon illusion was caused by a change in luminance or by a change in contrast with the sky background. 2 moons, apparently equal in size, were projected to 2 different levels and at the same level in the sky. The horizon moon appeared to be larger, regardless of its luminance, when compared to an upper moon. Nearness of the moon to the terrain appears to affect the apparent size of the moon more than the luminance of the moon or its contrast with the sky background.

R 9

26,856

Braunstein, D.N., Hooprich, E.A. & Rundquist, E.A. TRAINING UNDERSTANDING OF RELATIVE MOTION, I. AN EXPERIMENTAL EVALUATION OF SPATIAL REFERENCE SYSTEMS USED IN THE SOLUTION OF NAVAL MANEUVERING PROBLEMS. T. A. 3.1703.02.02. 1S2, Tech. Bull. 65 4, March 1965, 34pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif.

An initial experiment in a program of research on training in the understanding of problems of relative motion at sea is described. Instruction was modeled after that currently in use and emphasized practice in solving problems presented in written form. A comparison was made between possible systems of spatial reference: own ship in the center and guide ship in the center. Solving change-of-station problems using the guide ship system was faster for higher aptitude college students but for lower aptitude students there was no difference. A training method which alternated the reference systems from problem to problem proved poorer for lower aptitude students. Error criteria tended to confirm the superiority of the guide in center system but differences were not highly reliable. 2 operations used in obtaining problem solutions were found to be responsible for these results. General performance did not indicate any substantial understanding of the principles of relative motion problem solution in any of the groups, although a marked increase occurred in scores on the relative motion subtest of the Officer Classification Battery given 4 months later as part of a retention study. Results of the retention study confirmed original conclusions made concerning spatial reference systems. No conclusions affecting instructional practice should be drawn until the completion of the presently planned series of studies.

26,857

Hooprich, E.A. & Braunstein, D.N. TRAINING UNDERSTANDING OF RELATIVE MOTION: II. ANALYSIS OF ERRORS MADE IN SOLVING NAVAL MANEUVERING PROBLEMS. T. A. 3.1703.02.02.2S2, Tech. Bull. 65 6, March 1965, 40pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif.

As part of a series of studies concerning training in the solution of naval maneuvering problems, an analysis was made of errors committed by college students while solving change-of-station problems. One approach was a detailed classification of errors made on a final examination; another consisted of 5 short tests of the separate problem solution steps. Plotting, especially in the context of actual problems, was the major source of errors. There also were a large number of errors related to the use of the logarithmic time, speed, and distance scale. Measuring errors were relatively infrequent. The conversion of bearings and the use of the logarithmic time, speed, and distance scale are 2 operations that might well be improved by separate practice. However, the major source of errors, plotting, apparently could more likely be improved by training in an actual problem context rather than by simple drill on the mechanics of plotting. Although the data are not completely consistent, there is an indication that the use of the guide as the reference ship for solving change-of-station problems is less prone to several types of errors than is the use of own ship.

R 2

26,858

Loughridge, E.A. & Payne, W.H. A COMPARISON OF THE EFFECTS OF TWO MACH METERS ON OFFICER PERFORMANCE ON THE AIR BATTLE ANALYZER. Proj. 01703.02.07, Res. Rep. SRR 65 6, June 1965, 39pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 465555)

4 supplements to the Johns Hopkins Air Battle Analyzer, a classroom simulation device providing AAW decision making situations, were developed to simplify and increase the effectiveness of its use. The supplements are a) a rectangular plotting sheet permitting threat from any bearing; b) a range-altitude template which does rely on a printed paper scale; c) a simplified mach meter; and d) use of a separate protractor for bearing determination. An experiment comparing the mach meter with the meter accompanying the Analyzer was conducted. The new mach meter was found to be superior with respect to both time and errors.

R 1

26,859

Rasch, P.J., McDermott, R.W., Ottott, G.E. & Hamby, J.W. PHYSICAL TRAINING IN CONFINED SPACES. I. EVALUATION OF THE UNIVERSAL GYM. A PRELIMINARY REPORT. BuMed Proj. MR005.01, Task MR005.01 0030, Subtask 5, Rep. 1, May 1965, 11pp. USN Medical Field Research Lab., Camp Lejeune, N.C. (AD 464193)

The purpose of this study was to evaluate the Universal Gym and the Marcy Isometric Power Rack as means of developing and maintaining physical fitness in men confined to shipboard or in other restricted areas for some weeks. The hospitalmen used as Ss for this study do not appear representative of combat Marines and it is questionable as to whether the results apply to the latter. Several observations on the equipment itself and on the tests used are recorded. It is recommended that the study be repeated using typical Marine infantrymen as Ss and with provision for a control group in addition to the experimental group.

R 6

26,860

United Aircraft Corporation. MEDICAL AND BIOLOGICAL APPLICATIONS OF SPACE TELEMETRY. NASA SP 5023, July 1965, 66pp. National Aeronautics & Space Administration, Washington, D.C. (United Aircraft Corporation, Windsor Locks, Conn.).

In this document, pertinent facts have been discussed about biotelemetry systems which are implemented by such microminiaturized circuitry. These techniques are now being employed to develop biotelemetry systems, for instance, to serve in such areas as the wireless stimulation and monitoring of the behavior of free moving primates, unencumbered by wires or other gear. Similarly, large industrial organizations, as a result of their involvement with the space effort and the capabilities thus achieved, have gone on in their own laboratories to develop systems which provide a multiparameter monitoring complex for acutely ill patients. Here again, telemetry frees the patient from the need of physical connection with the central display system. It has also been pointed out that microminiaturized or hybrid devices, while characterized by desirable low power, smallness, and good reliability, are nevertheless costly to implement. In many cases, the prospective user of such a system may not require this maximum degree of refinement, for which costs may prove prohibitive. Under such circumstances, conventional solid-state elements could be used as pelletized components. Devices of this type are well exemplified by the excellent series of biomedical telemetry units now being developed by NASA Ames Research Center. Although these units probably represent the minimal limit in physical size attainable by this particular technology, under many requirements they prove sufficiently small for practical use in most biological contexts.

R many

26,861

Muckler, F.A. CURRENT AND FUTURE TRENDS IN MANUAL CONTROL SYSTEM RESEARCH. Contract NASw 869, Jan. 1965, 8pp. National Aeronautics & Space Administration, Washington, D.C. (Bunker-Ramo Corporation, Canoga Park, Calif.).

Based on an assessment of past and present theoretical and research work in the area of manual control systems, four distinct problem areas are discussed. First, the most exciting and active area in manual control research today is the development of quantitative theory; this should be the major future research area in the future. Second, there appears still to be, after 30 years of empiricism, a great deal of detailed ignorance about the fine, or microstructure, details of human behavior in control systems; the experimental strategy of the past has not particularly helped in reducing our uncertainty. Third, the technology and practice of the development, simulation and test of manual control systems seems to be on very favorable grounds; we have the tools, the methods, and the experience to develop, simulate and test hardware. Fourth, the only basic technical problem we have yet to overcome in the design of manual control systems is in the allocation of control function; this problem has seemed to be most intractable - and most essential for solution.

R 23

26,862

Simons, D.G. & Sparkman, W.C. THE ANCHOR BUTTON: AN ATTACHMENT TECHNIC FOR BIOMEDICAL INSTRUMENTATION LEAD WIRES. Task 775506, SAM TR 65 64, Sept. 1965, 6pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

The anchor button is a device to secure lead wires used for biomedical instrumentation. It is a solid plastic button, convex on one side and flat on the other. The flat side has a milled groove designed to receive the lead wires. A commercial sheet with adhesive on both sides is trimmed to form a disc which holds the lead wire in the groove of the button on one side and fastens the button assembly to the skin on the other side. It is a simple, neat, and reliable method for eliminating loose wires when monitoring an individual under dynamic stress testing or operational flight conditions.

R 4

26,863

Zinchenko, V.P., Mayzel', N.I. & Fatkin, L.V. QUANTITATIVE EVALUATION OF AN OPERATOR'S WORK IN INFORMATION RETRIEVAL. JPRS 31, 439, TT: 65 31935, Aug. 1965, 15pp. US Joint Publications Research Service, Washington, D.C. (Transl: Voprosy Psikhologii, May-June 1965, 3, 62-75).

In this paper, several investigations on information retrieval processes are examined in terms of a model based on the 'moving window' hypothesis, i.e., the information retrieval process can be represented as the scanning of the image field by an opaque mask containing a window. This process is structurally broken up into 4 stages: a) reception of command to begin search (we denote the amount of information processed in this stage by  $I_k$ ); b) retrieval process itself ( $I_v$ ); c) primary processing of information ( $I_o$ ); d) selection of primary response ( $I_g$ ). The total amount of information processed by the operator in 1 search cycle (for example, in separating all the elements of the information field possessing a specified feature) is equal to the sum of the amount of information processed in each stage of the process. The formulae for computing the information for these stages are presented.

R 8

26,864

Bekey, G.A., Meissinger, H.F. & Rose, R.E. A STUDY OF MODEL MATCHING TECHNIQUES FOR THE DETERMINATION OF PARAMETERS IN HUMAN PILOT MODELS. Contract NAS 1 2582, NASA CR 143, Jan. 1965, 162pp. National Aeronautics & Space Administration, Washington, D.C. (TRW Space Technology Laboratories, Redondo Beach, Calif.).

This report presents the results of a study of techniques for the determination of parameters in mathematical models of the human pilot. This study departs from conventional approaches where the pilot is characterized by transfer functions or quasi-linear describing functions, progressing into the domain of time-variant and nonlinear operations and representative models of this type. The final portion of the study is concerned with manual tracking in 2 axes where the operator is modeled as a multiple input-multiple output system. The emphasis has been placed primarily on development of computational methods and, hence, model matching experiments on synthetic pilots with known parameters were required. The resulting methodology was successfully applied to actual pilot tracking data and provided new insight into the pilot's dynamic response. The experimental results are presented in the report. A part of the study was devoted to the comparison of continuous and iterative parameter adjustment methods. In addition, significant analytical results were derived pertaining to the nature of parameter optimization by the gradient method. The report concludes with a recommendation of areas for further study of mathematical pilot models.

R 21

26,865

Tomlinson, Helen. DEFINING TECHNICAL INFORMATION NEEDS FOR A RESEARCH LABORATORY. Projs. 6755, 7717, 7719, 7734, PRL TR 65 4, March 1965, 12pp. USAF Personnel Research Lab., Lackland AFB, Tex.

A checklist survey form listed 78 areas of probable or possible interest to members of a personnel research laboratory. Staff members responded to each item by marking 1 of 4 of interest. A computer grouping technique was applied to cluster the 71 interest profiles in terms of common interests. 7 groups were identified and characterized by the major overlapping topics. The final cluster that included all staff members provided a listing of the topics in terms of overall laboratory concern. Results define the organization's technical information requirements and identify specialized consultants on acquisition and indexing problems.

R 5

26,866

Gagliardi, U.O. DATA FILE SIZE AND ITS RELATION TO THE BAYESIAN EFFECTIVENESS OF AN INFORMATION RETRIEVAL SYSTEM. Contract AF19(628)5057, Proj. 2806, Task 280609, ESD TR 65 275, April 1965, 80pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Dunlap & Associates Incorporated, Darien, Conn.).

A simple Bayesian measure of system effectiveness for information retrieval systems is proposed. The measure combines the recall and precision ratios of an information system with the utility structure of the system user. Using the measure, it is possible to show that effective systems are possible only under a very narrow set of conditions. In particular, it is shown that using present state-of-the-art indexing, it is not possible to have effective systems with file sizes much in excess of 100,000 documents.

R 7

26,867

Human Factors Research, Incorporated. RESEARCH ON THE DEVELOPMENT OF SHIPBOARD PERFORMANCE MEASURES AND PERFORMANCE JUDGMENTS. FINAL REPORT. Contract Nonr 1241(00), Proj. NR 153 165, Jan. 1965, 22pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Human Factors Research, Incorporated, Santa Barbara, Calif.).

This paper reports in summary form, the results of 12 studies; 9 concerning research on shipboard performance measures and 3 studies on judgements of performance. The following studies are represented in this compilation: a) Research on the development of shipboard performance measures, Part I, The use of practical performance tests in the measurement of shipboard performance of enlisted naval personnel; b) Part II, The use of a performance rating scale in the measurement of shipboard performance; c) Part III, The use of performance check lists in the measurement of shipboard performance; d) A comparison between rated and tested ability to do certain tasks; e) Part V, Interrelationships between aptitude test scores, performance in submarine school, and subsequent performance in submarines as determined by ratings and tests; f) Technical Report VI, Performance under stress: A review and critique of recent studies; g) Technical Report VII, A factor analytic study of aptitudes, interests and practical performance skills for Navy machinery repairman students; h) The predictability of ratings as a function of interrater agreement; i) Technical Report IX, Supervisory ratings and practical performance tests; j) A study of factors influencing the judgement of human performance; k) Rater performance skill and attitudes towards performers; l) The influence of unusual performances and time-order on performance judgement.

R 19

26,868

Gray, S.B. DOCUMENT FORMAT RECOGNITION. FINAL REPORT. Contract AF30(602) 3273, Proj. 4599, Task 459902, RADC TDR 64 463, Rep. F 3060 1, Jan. 1965, 464pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Sylvania Electronic Systems, Sylvania Electric Products, Inc., Waltham, Mass.). (AD 611632)

This study is primarily concerned with methods for analyzing the format of pages from technical journals, and means for automatically processing the textual and graphic material on these pages for input to a computer which is to perform textual data processing functions, e.g., automatic language translation, automatic abstracting, automatic indexing, etc. This analysis and processing includes text-graphic separation, location of graphics, and textual analysis and recognition. The overall process is considered to be a Format Recognition and Analysis Program operating on a computer-controlled character recognition device. This study has resulted in general design techniques for Format Recognition and Analysis Programs applicable to any document which occurs with text and graphics intermixed. 2 such programs have been completed, tested, and demonstrated for 2 technical journals, 1 Soviet and 1 U.S., and a 3rd program has been outlined and partly written for another Soviet journal. It has been found that almost any journal can be programmed without serious difficulty, but new journals require substantially different programs. Also considered in detail is a design for the Universal Print Reader. This device, while novel and complex, involves mainly techniques which have been tried and proven in present print reader devices. However, an order of magnitude improvement in versatility can be achieved, and a similar improvement in recognition accuracy seems possible. An augmented version of the Universal Print Reader, which enables fully automatic page composition of translated versions of journal pages, is briefly described. This device, while possessing important economic advantages over manual semiautomatic journal page composition, involves several new techniques not yet proven. One such technique in need of further development is graphic reproduction and enhancement.

26,869

Dishong, W.R., Jr. & Eastman, R.O. COST EFFECTIVENESS IN COMMUNICATION SYSTEMS. Contract SF 006 02 09, (NEL B2086), NEL Rep. 1323, Oct. 1965, 54pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

A mathematical model was developed for evaluating the cost effectiveness of communication systems. Measures of effectiveness are defined; cost is discussed as the common denominator in applying these measures. A preliminary flow diagram illustrates computerized application of the model technique. System characteristics considered in evaluating system performance include modulation technique, signal fading, diversity reception, and coding.

R 17

26,870

Hammel, H.T. ONE METHOD FOR ASSESSING COLD TOLERANCE: THERMAL AND METABOLIC RESPONSES TO MODERATE WHOLE BODY COLD EXPOSURE AT NIGHT. FINAL REPORT. Contract AF 41(609) 1970, Proj. 8237, Task 823701, AAL TR 64 32, Aug. 1965, 52pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (John B. Pierce Foundation Laboratory, New Haven, Conn.). (AD 474363)

The International Biological Program (IBP) is the successor in the biological field to the International Geophysical Year in the physical field. This report discusses 1 of the methods, approved by a working party of the IBP, for determining the cold tolerance of various ethnic groups under field conditions. A standardized cold stress for a 8-hr. period during the night is provided by a portable environmental chamber developed by the contractor. Measurements of metabolism and body temperature, with a high degree of accuracy, and the obtaining of EEG and EMG tracings during the cold exposure, are necessary. These parameters can be obtained by either modifying standard medical laboratory equipment available from commercial sources, or constructing new equipment according to the instructions of the contractor.

R 15

26,871

Retterer, B.L., Griswold, G.H., McLaughlin, R.L., Topmiller, D.A. THE VALIDATION OF A MAINTAINABILITY PREDICTION TECHNIQUE FOR AN AIRBORNE ELECTRONIC SYSTEM. FINAL REPORT JANUARY 1964-SEPTEMBER 1964. Contract AF 33(615) 1338, Proj. 7184, Task 718406, AMRL TR 65 42, May 1965, 66pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Radio Corporation of America, Camden, N.J.).

A technique for predicting the maintainability, at the field maintenance level, of airborne electronic equipment was investigated. In the technique, which was based on one previously developed for ground electronic systems, design features, skill requirements, facilities and the maintenance environment are used to predict maintenance times. Predictions of elemental task-times involved in maintaining the AN/APX-46 airborne IFF were computed from ratings made independently by Air Force and contractor (RCA) personnel. These predictions were compared with each other and with data collected under field conditions in which malfunctions were artificially introduced. The 2 independent predictions of overall down time were in close agreement with each other, however, there was little agreement between the elemental task-time predictions. Although the field-condition data were limited, the analyses suggest that the prediction equation would tend to overestimate actual times. On the basis of this study it cannot be concluded that the technique, as used, accurately predicts maintenance down-time of airborne electronic equipment. However, it appears that portions of the technique could be used to evaluate the relative maintainability of alternative designs. Suggestions for modifying the techniques and for improving the predictions are presented.

R 6

26,872

Perry, D. & Cantley, G. COMPUTER PROGRAMMER SELECTION AND TRAINING IN SYSTEM DEVELOPMENT CORPORATION. Tech. Memo. 2234, Feb. 1965, 62pp. System Development Corporation, Santa Monica, Calif. (AD 612956)

This document describes the program developed by SDC and its predecessor, the System Development Division (SDD) of the RAND Corporation, for selecting and training computer programmers. The programming field is described in terms of the knowledge required, the nature of the programs which are produced, and the activities involved in producing programs and data bases. These elements may be grouped in many different ways to form specific programming jobs. An initial analysis has identified 17 such jobs. The projected growth of the data processing field indicates a continued need for industrial training of programmers. Improvements in selection and training can be expected to result from better knowledge of programming jobs, continued research on selection techniques, and applications of new instructional methods.

R 15

26,873

Holland, J.G. & Kemp, F.D. A MEASURE OF PROGRAMING IN TEACHING-MACHINE MATERIAL. J. educ. Psychol., 1965, 56(5), 264-269. (Harvard University, Cambridge, Mass.). (Reprint)

A quantitative measure was developed for the degree to which teaching-machine material is programed. This measure, the blackout ratio, is the percentage of words that can be obliterated in a program without influencing error rate. This measure was demonstrated with a program in which 69% of the words were removed without influencing error rate.

R 2

26,874

Hardacre, L.E. & Kennedy, R.S. SOME ISSUES IN THE DEVELOPMENT OF A MOTION SICKNESS QUESTIONNAIRE FOR FLIGHT STUDENTS. BuMed. Proj. MR005.13 6001.1.104, NSAM 916, March 1965, 5pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

Responses to an experimental Motion Sickness Questionnaire were compared with actual motion sickness resulting from exposure to Coriolis effects at 7.5 rpm. Answers to 12 items were related to subsequent motion sickness. In an effort to ascertain honesty of responses to the questionnaire, it was administered to 3 groups with varying instructions: 1 group received a rider which indicated their responses were for research purposes only and would not affect their future careers in aviation; the 2nd had this rider omitted; the 3rd had it included but pencilled out and still readable (negative assurance). No significant differences in scores among these groups or with the experimental group above were found.

R 12

26,875

Lindsey, J.F. COMPUTER UTILIZATION OF TIME-LINE MEDICAL DATA FROM MAN IN SPACE FLIGHT. NASA TN D 2695, Sept. 1965, 28pp. National Aeronautics & Space Administration, Washington, D.C.

This time-line approach has been developed for accomplishing the following purposes: safety of astronauts while in flight, development of scientific products, and standardization of in-flight and ground-based medical data so that they are in form for computer input and analysis. It involves preparing medical data both on magnetic tape and on consecutive data sheets for appropriate portions of all NASA manned space flights. Each data sheet shows the physician all relevant information of interest for a specified time interval - a 10-sec. interval during stressful periods such as exit and reentry, and a 1-min. interval during weightlessness. Data on each successive data sheet includes analog and digital indicators of astronaut beat-to-beat heart rate, pulmonary ventilation, and various spacecraft environmental as well as astronaut performance measures. Identical types of data pertaining to each astronaut have been recorded for comparable time periods for each of the 6 manned Mercury space flights and the Gemini flights to date, e.g., the periods of exit and reentry, and periods when identical functions were being performed. Selected ground-based medical data also have been prepared in this manner. Examples of types of analyses that have been performed together with limitations are discussed. Several aspects are discussed under the following 4 categories: graphical analyses, rate-of-change and rate-of-rate-of-change analyses, some computer programs for statistical analyses, and statistical model limitations.

R 16

26,876

Sjöberg, L. ON RATIO ESTIMATION. Number 191, April 1965, 12pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

It is proposed that the phenomenon of bias in direct estimation methods be referred to the level of parameters, not to the level of operations. A re-analysis of several sets of published data reveals certain consistent trends. Subjective value for the position of variable stimulus is most often larger than the value for the same stimulus as standard, sometimes with a reversal of the trend for extreme stimuli. An analysis of magnitude estimation data indicates that the critical condition is that of to which stimulus a certain number is pre-assigned and not rank order per se. Thus, contrast and assimilation are ruled out as possible explanations.

R 11

26,877

Duggar, B.C., Rosenberg, R.C., Sheridan, T.B. & Mayer, Sylvia R. DESIGN AND USE OF INFORMATION SYSTEMS FOR AUTOMATED ON-THE-JOB TRAINING. VOLUME IV. GRAPHICAL SYMBOLOLOGY AND LOGIC DIAGRAMS FOR USE AS TRAINING AIDS. Contract AF19(628)455, Proj. 7682, Task 768204, ESD TDR 64 234, Jan. 1965, 37pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Bio-Dynamics Incorporated, Cambridge, Mass.)

This report describes the results of a study to develop a graphical symbology and logic diagramming technique for use as a training aid. This work is addressed to the need for a language which describes the logical relationships among task components and the interactions between man and machine in advanced computer-based information systems. Symbols and a logic diagramming technique were developed and refined by utilization with several different types of tasks. This "language" has been found to be useful for the following purposes: a) to supplement written instruction manuals; b) as an instructional tool without text; and c) as a performance aid when displayed directly on an operational console. A step-by-step methodology for constructing logic flow diagrams is presented, and applications are discussed.

R 9

26,878

Sheridan, T.B. (Princ. Investigator). DESIGN AND USE OF INFORMATION SYSTEMS FOR AUTOMATED ON-THE-JOB TRAINING. VOLUME III. EXPERIMENTAL USE OF THREE INSTRUCTIONAL CONCEPTS. Contract AF 19(628) 455, Proj. 7682, Task 768204, ESD TDR 64 234, March 1965, 74pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Bio-Dynamics Incorporated, Cambridge, Mass.).

This report describes 3 experiments in which novel teaching concepts were demonstrated. These concepts had been proposed in previous reports but their effectiveness remained to be verified experimentally. The results were: a) A teaching program ordered according to the discovery principle significantly reduced errors and performance time over that observed after training with a conventional training manual; b) Slides projected directly onto a control console, together with a taped lecture, were found to be an effective method of presenting an automated training program; c) Graphical logical flow diagrams were found to be efficient instructions for teaching procedures for performing a querying-reasoning task. It was concluded that these concepts should be exploited in training programs for operators of Air Force Information Systems.

R 10

26,879

Scott, G.A., Bradbury, P.W., Eichenlaub, J.H. & Mitchell, R.H. IMPROVED EQUIPMENT ARRANGEMENTS FOR ARTC CENTERS. FINAL REPORT. Proj. 150.523 OIX, Rep. RD 65 27, March 1965, 83pp. US Systems Research & Development Service, FAA, Atlantic City, N.J. (AD 615266)

This report describes the continued experimental development and testing effort directed toward in-service improvements to existing Air Route Traffic Control Center operational equipments. Through the use of an environmental laboratory, the In-line, Peninsula and Island console designs were established, modified and appraised. Field controller opinion and recommendations were used as a basis for determining the advantages or disadvantages of particular equipments and their locations, console modifications and configurations. The report recommends the most favorable placement of operational equipments and controls, as well as substantial improvements in sector lighting, information displays and hardware modification.

26,880

Weinberg, L.W.T. CRASHWORTHINESS EVALUATION OF AN ENERGY-ABSORPTION EXPERIMENTAL TROOP SEAT CONCEPT. FINAL TECHNICAL REPORT. Contract DA 44 177 AMC 116(T), Task 1A024701A12101, USA TRECON 65 6, Rep. AvSER 64 11, Feb. 1965, 71pp. USA Transportation Research Command, Fort Eustis, Va. (Aviation Safety Engineering & Research, Flight Safety Foundation, Phoenix, Ariz.). (AD 614582)

This report is an evaluation of an experimental troop seat concept that was progressively developed and dynamically tested. The seats were installed and tested along with other equipment in 4 full-scale crashes of CH-21 helicopters. The designs submitted represented progressive steps in the development of a troop seat using strut-type energy attenuation. The basic concept was a single-passenger, side-facing, bucket seat. Anthropomorphic dummies, restrained by lap belts and single diagonal chest straps, were placed in the seats to provide simulated human loading characteristics during impact. Accelerometers were mounted in the pelvic cavity of the dummies to permit recording of the impact decelerations. Floor accelerations were also measured near the seat installations. Tensimeters recorded the belt forces. High-speed cameras positioned in the helicopters recorded the reaction of the dummies and experimental seats during the crash sequences. The seats were divided into 2 basic functional units: 1st, a seat base incorporating an energy-absorbing strut to provide the vertical support; and 2nd, a curved nylon seat back that was designed to provide the occupant with restraint in the lateral and longitudinal directions, in addition to the restraint provided by the lap belt and chest strap. The test series demonstrated the effectiveness of strut-type energy absorption as a method of attenuating crash forces.

26,882

Mathis, J.V., Dickerson, T.J., Butler, C. & Mazzilli, F. SUPPLEMENTARY CORRECTIVE MAINTENANCE BURDEN PREDICTION PROCEDURES. VOLUME I. STUDY REPORT, FINAL REPORT. Contract Nonr 3821(00), Rep. ND 65 31, March 1965, 84pp. USN New Development Research Branch, Washington, D.C. (Federal Electric Corporation, Paramus, N.J.).

Because of the requirement for developing the personnel subsystem concurrently with hardware development, manpower predictions must be made at various points in the equipment development cycle. Consequently, for the CMB Prediction Procedure to be an effective predictive tool, it must have the capacity to be applied at key points in an equipment's development cycle when only a very limited amount of data may be available. Presented in this report are the results of the study to develop supplementary Corrective Maintenance Burden Prediction Procedures that would be applicable in various phases of equipment development. The procedures are intended for application as an electronic equipment development program progresses through its various phases from inception to the point where application of the original and most detail prediction procedure becomes practical. Procedure A provides a means for estimating primary corrective maintenance time requirements by technician skill level using only the general descriptive information that should be available during the Operational Requirement Phase of an equipment development program. Procedure B is somewhat more detailed in application than Procedure A, and has the sensitivity necessary to utilize the additional design information that should be developed during the System Planning Phase of an equipment development program. Procedure C provides the means whereby an even more detailed analysis can be performed by considering additional data generated during the System Design Phase. This procedure is similar in application to the original prediction procedure but permits sufficient generalization to have practical application before detail circuit schematics have been prepared. Detail instructions for application of the 3 procedures are presented in Volume II (HEIAS 26,883).

R 6

26,883

Mathis, J.V., Dickerson, T.J., Butler, C. & Mazzilli, F. SUPPLEMENTARY CORRECTIVE MAINTENANCE BURDEN PREDICTION PROCEDURES. VOLUME II. PROCEDURAL INSTRUCTIONS AND ILLUSTRATIVE APPLICATION. FINAL REPORT. Contract Nonr 3821(00), Rep. ND 65 31, March 1965, 109pp. USN New Development Research Branch, Bureau of Naval Personnel, Washington, D.C. (Federal Electric Corporation, Paramus, N.J.).

This report presents the detailed instructions of the 3 supplementary procedures described in Volume I (HEIAS 26,882). To facilitate assimilation, each procedure discussed is a separate section with hypothetical illustrations. The instructions and respective illustrated applications are on facing pages. Data and worksheets are referenced and included in the rear of each section. Also the skills, knowledge, required training, and personnel qualifications are tabulated. (HEIAS)

R 3

26,884

Goldberg, M.N., Kendall, J.I. & Santschi, W.R. INDIVIDUAL RESPIRATORY PROTECTION AGAINST CHEMICAL AND BIOLOGICAL AGENTS (U). SECOND QUARTERLY PROGRESS REPORT, 1 OCTOBER 1964-31 DECEMBER 1964. Contract DA 18 035 AMC 286(A), Proj. 1C622401A095, Rep. 2, Jan. 1965, 127pp. USA Chemical Research & Development Labs., Edgewood Arsenal, Md. (North American Aviation, Incorporated, Los Angeles, Calif.). (AD 465030)

Research is reported for each of the following areas: a) seals; b) respiratory impedance; c) contaminant leak detection instrumentation; d) physiological measures of burden (EEG); e) anthropometric clearance envelopes and the determination of universal fit feasibility; f) materials (ethylene-propylene terpolymer); g) visual scanning range; and h) eyelens fogging/frosting.

R 81

26,885

Brown, J.H. & Crampton, G.H. QUANTIFICATION OF THE HUMAN NYSTAGMIC RESPONSE TO ANGULAR ACCELERATION. PREDICTION FORMULAE AND NOMOGRAPH. Acta otolaryng., ca. 1965, 58, 535-564. (USA Medical Research Lab., Fort Knox, Ky.). (Reprint) (AD 467138)

5 young adult men with normal labyrinthine function were stimulated by a series of graded angular accelerations, during which they carried out particular mental tasks. Each S was seated at the center of rotation, eyes open, and with head fixed with a bite board so that the lateral canals were in the horizontal plane of rotation. The S was enclosed in a capsule which provided a totally dark environment and shielded him from wind currents. Low-level masking noise and vibration prevented detection of extraneous cues related to angular velocity. Ocular nystagmus was analyzed second-by-second and an empirical equation fitted to the data.

R 5

26,886

Janni, J.F., Clark, B.C., Schneider, Marion F. & Berger, P.S. A DOSE-EQUATED MANIKIN FOR SPACE RADIATION RESEARCH. Proj. 8803, AFWL TR 65 97, Aug. 1965, 38pp. USAF Weapons Lab., Kirtland AFB, N.M.

The radiation environment to which a manned spacecraft is exposed is composed of a heterogeneous mixture of charged particles. Theoretical calculations show that the dose profile throughout a human body varies markedly depending upon the dose point and the incident radiation spectrum. To allow experimental comparisons with theoretical estimates of the dosages and depth-dose patterns in an actual human body, a phantom has been constructed which simulates the true geometry of a human body, as well as its interaction with all types of energetic radiation. With this manikin it is possible to perform precise experimental measurements of the change in absorbed dose throughout the body for any number of radiation environments. A detailed dose-equivalency study of the manikin has been carried out for photons, protons, electrons, and neutrons. The manikin contains every element which composes at least 0.1% of the human body. The interaction characteristics of the manikin are dose-equated to within 15% for neutrons, and within 10% for photons with energies greater than .04 Mev. The response is within 1.5% for electrons with energy between .05 Mev and 10.0 Mev, less than 1.2% for protons with energy greater than 1.0 Mev, and within 1.2% for alpha particles of energy greater than 5 Mev. Dosimeters may be inserted in important organs and other appropriate locations within the body. Extensive environmental testing has been done to guarantee the capability of the manikin to withstand the rigors of spaceflight launch and recovery.

R 19

26,887

Craig, F.N. & Cummings, E.G. THE SPEED OF ACTION OF ATROPINE ON SWEATING. Proj. 1C62401A097, Rep. CRDLR 3277, April 1965, 27pp. USA Chemical Research & Development Labs., Physiology Div., Edgewood Arsenal, Md. (AD 463833)

Continuous recording of body weight was used to measure the influence of intravenously injected atropine sulfate on sweating in 3 men. Most of the skin surface was kept dry by air movement at 1.5 m/sec. The sequence of events was: a) completion of injection in 1.1 min; b) cardiac acceleration in 1.3 min; and c) inhibition of sweating in 3.5 min. The minimum rate of weight loss occurred at a dose of 0.5 mg; larger doses prolonged the inhibition without intensification. Heat storage was equal to an average of 92% of the deficit in evaporative heat loss. Although sweating returned to the initial rate within 1 hr., the normal increase in sweating at elevated body temperatures was prevented for the next hour. Sweating responds to atropine almost as rapidly as the cardiac rate.

R 15

26,888

US Joint Publications Research Service. PROBLEMS OF PSYCHOLOGY. JPRS 30,396, TT: 65 31154, June 1965, 132pp. US Joint Publications Research Service, Washington, D.C. (Transl: Voprosy Psikhologii, Jan. 1965, 1, 1-132.).

This report is a translation of 10 articles from the Russian-language periodical (Problems of Psychology): operator's channel capacity as an index of training complexity of a performed task; on the understanding of heuristic activity in cybernetics and psychology; the role of the orienting reflex in action organization; an experimental investigation of probabilistic prognostication in pathological states; an information theory approach to a study of perception disturbances; an experiment on collective hypnopedias; can a machine think?; an experimental device for remote perimetric investigation of visual perception; investigation of the human operator's tracking behavior; and the first Leningrad Conference on problems of engineering psychology. (HEIAS)

R 151

26,889

Rolls, L.S., Drinkwater, F.J., III & Innis, R.C. EFFECTS OF LATERAL CONTROL CHARACTERISTICS ON HOVERING A JET LIFT VTOL AIRCRAFT. NASA TN D 2701, March 1965, 12pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

3 levels of total control power and 3 values of maximum stick travel ( $\pm 4.5$ ,  $\pm 3.5$ ,  $\pm 3.0$  in.) were tested for the X-14A VTOL research aircraft. Airframe damping was also varied. Two NASA pilots evaluated the relative importance of these parameters as maneuvering requirements for a hovering VTOL aircraft. They rated total control power as having a predominant effect during visual hovering out-of-ground effect. Changing the control sensitivity (control power per inch of stick travel) had only a minor effect over the range of sensitivity investigated. During steady hovering, the increased sensitivity reduced the pilot's work load; thus, it would seem to be more favorable.

R 5

26,890

Miller, G.K., Jr. & Fletcher, H.S. FIXED-BASE-SIMULATOR STUDY OF ABILITY OF PILOTS TO PERFORM SOFT LUNAR LANDINGS BY USING A SIMPLIFIED GUIDANCE TECHNIQUE. NASA TN D 2993, Oct. 1965, 26pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A 6-degree-of-freedom fixed-base-simulator study has been conducted of the ability of pilots to perform soft lunar landings by using a simplified guidance technique to deorbit from a synchronous transfer orbit and to place the landing vehicle in a position from which a vertical descent to touchdown in a specified area can be accomplished. The pilot had control of vehicle thrust along the longitudinal axis and of attitude through an acceleration command system. No automatic damping or control was assumed. The general piloting procedure consisted of maintaining a constant thrust angle with respect to the orbiting command module until nearly zero velocity was attained at an altitude of approximately 5000 ft (1524m). A vertical descent was then made to the lunar surface. Initially, a nominal trajectory was flown for which the deorbiting procedure was specified; subsequently, several off-nominal trajectories were flown. The results of the investigation indicated that the pilot's use of the simplified guidance technique with rather crude thrust-angle measurements resulted in placing the vehicle in a position from which soft landings in the desired lunar area could consistently be made. The characteristic velocity required for piloted landings was within about 10 percent of that required for a perfectly flown nominal trajectory.

R 3

26,891

Miller, G.K., Jr. & Fletcher, H.S. SIMULATOR STUDY OF ABILITY OF PILOTS TO ESTABLISH NEAR-CIRCULAR LUNAR ORBITS USING SIMPLIFIED GUIDANCE TECHNIQUES. NASA TN D 2631, Feb. 1965, 40pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A study has been made with a 6-degree-of-freedom fixed-base simulator of the ability of pilots to establish 486 000-foot (80-nautical-mile) circular orbits about the moon using a simplified guidance technique. The pilot had control of thrust along the longitudinal axis and of vehicle attitude through an acceleration command system. No automatic damping or control was assumed. The general guidance procedure consisted of maintaining a constant thrust angle with respect to the lunar horizon until attaining the proper altitude with zero radial velocity. A constant-altitude deceleration maneuver was then performed to attain the proper circumferential velocity. Initially, a "nominal trajectory" was flown for which the exact operating procedure was specified; this trajectory was followed by several off-nominal trajectories for which no operating procedure was specified. The results of the investigation showed that if velocity and altitude information were available, the pilots could consistently establish orbits lying within an altitude range from 361,000 to 611,000 feet by using rather crude angle measurements. The characteristic velocity required to perform the maneuver was within 5% of that required for a perfectly flown nominal. The pilots could consistently establish circular orbits from the nominal-approach trajectory in the absence of velocity and altitude information. This condition was accomplished by maintaining a constant thrust angle with respect to the lunar horizon for a given time followed by a second constant thrust angle for a second specified time. This procedure did not result in the establishment of near-circular orbits when used under the influence of possible earth-based tracking errors but did result in establishing nonimpacting orbits.

R 2

26,892

Llewellyn, C.P. SIMULATOR STUDY OF PILOT-CONTROLLED LUNAR TAKE-OFF AND RENDEZVOUS. NASA TN D 2778, May 1965, 39pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A 3-degree-of-freedom, fixed-base simulation study of pilot-controlled lunar trajectories from lift-off through rendezvous with a space station orbiting at a 100-nautical-mile altitude has been made. The results of this planar study have shown that a pilot can visually determine his launch time and effectively manually control both vehicle attitude and main-engine cut-off to arrive at the proper altitude and position to successfully and efficiently initiate and complete a rendezvous maneuver. It has also been shown through the use of 3 trajectories having coast angles of 24°, 90°, and 180° that a launch window of about 4 minutes is available. An early launch capability extended the launch window to about 5 minutes and alleviated some of the launch on-time problems.

R 4

26,893

Lewis, J.L. & Wheelwright, C.D. LUNAR LANDING AND SITE SELECTION STUDY. NASA TN D 2999, Sept. 1965, 20pp. National Aeronautics & Space Administration, Washington, D.C. (Manned Spacecraft Center, NASA, Houston, Tex.).

The Apollo lunar excursion module (LEM) is presently scheduled for lunar landing in sunshine conditions. However, several operational constraints presently impose severe penalties on the Apollo mission launch window. The extension of the LEM landing capability to include certain earthshine conditions provides additional latitude where these constraints are concerned. A study was made of the possible extension of the launch window for the Apollo mission by defining the minimum brightness level for successful lunar landing. The pilot's ability to select and commit to a landing site, the trajectory, and window visibility requirements were evaluated in various lunar brightness levels. A helicopter with a modified LEM window was used on the LEM trajectories from 1000 ft altitude to the surface. 50 flights were made over homogeneous terrain. Observers wore neutral density filters to simulate lunar brightness levels ranging from 1/4 earthshine, lowest mare albedo, to full earthshine, maximum mare albedo. Landing site selection, commitment to landing, and total time to touchdown are generally inversely proportional to the brightness level. Observer comments indicate that the pilot's landing commitment confidence level is unacceptable below a brightness level of 0.04 ft-L.

R 5

26,894

Kelly, J.R. & Winston, M.M. STABILITY CHARACTERISTICS OF A TANDEM-ROTOR TRANSPORT HELICOPTER AS DETERMINED BY FLIGHT TEST. NASA TN D 2847, June 1965, 30pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

Selected, unaugmented stability characteristics of a modern tandem-rotor transport helicopter were determined by a flight investigation. The angle-of-attack instability was the predominant factor which resulted in unacceptable maneuver stability characteristics. Also present were speed and directional instabilities. Based on pilots' comments, the current V/STOL specifications concerning handling qualities appeared applicable to a helicopter of this size and configuration. Theoretical calculations of the pitch and roll damping showed good agreement with flight measurements.

R 10

26,895

Jarvis, C.R. & Lock, W.P. OPERATIONAL EXPERIENCE WITH THE X-15 REACTION CONTROL AND REACTION AUGMENTATION SYSTEMS. NASA TN D 2864, June 1965, 48pp. National Aeronautics & Space Administration, Washington, D.C. (Flight Research Center, NASA, Edwards AFB, Calif.).

The performance and operational characteristics of the 2 reaction control systems used in the X-15 airplane are discussed. Control of the X-15 during flight at low dynamic pressures was satisfactory with the manual acceleration command reaction controls. During the early stages of reentry, however, the control task was complicated by aerodynamic forces. The addition of a reaction augmentation system made the task easier. Although proportional controls were designed into the X-15 reaction control system, the pilot used them generally as on-off controls. The problems encountered during the development of the reaction control system were the result of an unsuitable application of aluminum components in the hydrogen-peroxide system. Aircraft structural vibration necessitated the addition of an electronic filter to the electronics assembly of the reaction augmentation system.

R 11



26,896

Hall, A.W. & McGinley, D.J., Jr. FLIGHT INVESTIGATION OF STEEP INSTRUMENT APPROACH CAPABILITIES OF A C-47 AIRPLANE UNDER MANUAL CONTROL. NASA TN D 2559, Jan. 1965, 15pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A flight investigation has been conducted to determine the steep instrument approach capabilities and limitations of a C-47 airplane under manual control. This study included an investigation of flare paths suitable for transition from the steep glide slope to a final terminal angle to touchdown. The maximum glide slope feasible for operational use in an instrument approach was 6°. More pilot effort and concentration were required to fly the 6° glide slope than were required for the 2 1/2° slope and the flight-path deviations were also somewhat greater for the 6° slope. The greatest problem during the approach or flare was the effort required to maintain the proper lateral directional control. In the opinion of most of the pilots, instrument approaches to touchdown could be made repeatedly with manual longitudinal control if lateral directional control was automatic. The most suitable flare paths were those which required 4 to 6 sec per degree of flight-path change from the 6° glide slope to the final terminal angle.

R 4

26,897

Hardy, G.H., West, J.V. & Gunderson, R.W. EVALUATION OF PILOT'S ABILITY TO STABILIZE A FLEXIBLE LAUNCH VEHICLE DURING FIRST-STAGE BOOST. NASA TN D 2807, May 1965, 60pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

The feasibility of manned participation in the control of the atmospheric flight of a large launch vehicle was investigated. Studies included simulation of rigid, elastic, and fuel-sloshing dynamics of the Saturn V lunar mission vehicle. Fixed cockpit and centrifuge results indicate that pilots could satisfactorily stabilize the vehicle and reduce structural loads. They were also able to handle wide variations in vehicle parameters and to handle certain failure situations.

R 7

26,898

Holzhauser, C.A., Innis, R.C. & Vomaske, R.F. A FLIGHT AND SIMULATOR STUDY OF THE HANDLING QUALITIES OF A DEFLECTED SLIPSTREAM STOL SEAPLANE HAVING FOUR PROPELLERS AND BOUNDARY-LAYER CONTROL. NASA TN D 2966, Sept. 1965, 42pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

Flight and simulator tests were made to study low-speed handling qualities, potential STOL problem areas, and causes of deficiencies and their solutions. Tests of the STOL seaplane were made in the 50- to 60-knot speed range with Automatic Stabilization Equipment (ASE) engaged and disengaged. During the simulation, several stability and damping derivatives were varied and evaluated. During the flight tests, take-offs and landings were made from water at 50 knots, corresponding to a lift coefficient of about 4. With the ASE engaged, the handling characteristics of the aircraft were satisfactory. The ASE provided roll and pitch attitude stabilization and increased rate damping about these axes. With the ASE off, the handling characteristics were unsatisfactory because of low static longitudinal stability, a very unstable spiral mode, and large sideslip excursions during turn entries. Response to control inputs was satisfactory about the roll and pitch axes, but the like rotation propellers reduced the directional control to an unsatisfactory level. The simulator tests were useful in providing a preliminary evaluation and in studying the causes of deficiencies and their solutions. Good correlation was obtained between the simulator and flight results with the exception that the sideslip excursions during maneuvering were larger in flight than on the simulator.

R 6

26,899

Feistel, T.W. & Drinkwater, F.J. III. FLIGHT TESTS OF A ONE-MAN HELICOPTER AND A COMPARISON OF ITS HANDLING QUALITIES WITH THOSE OF LARGER VTOL AIRCRAFT. NASA TN D 3060, Oct. 1965, 14pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.).

A limited flight test program has been accomplished with a one-man Hiller YROE-1 "Rotor-cycle" (gross wt = 500 lb) to help determine criteria for the handling qualities in hover of VTOL aircraft as affected by gross weight. The generally high orders of longitudinal and lateral control power and damping inherent were found to be satisfactory. The high directional control sensitivity, combined with high yaw response in one direction, was considered potentially dangerous. The lateral control power for this craft is approximately the same as that found necessary for satisfactory control with similar damping in tests of 2 other VTOL aircraft with substantially greater gross weight.

R 11

26,900

Evvard, J.C. LIMITS ON OBSERVATIONAL CAPABILITIES OF AEROSPACECRAFT. NASA TN D 2933, July 1965, 16pp. National Aeronautics & Space Administration, Washington, D.C. (Lewis Research Center, NASA, Cleveland, Ohio).

The principal limit on the observational capability of aerospacecraft is set by atmospheric turbulence. Most of the effect, however, is due to the distortions of the light path near the surface (up to 15 km), where the air density is high. Hence, the viewing accuracy of a satellite 0 looking at the ground is generally much higher than for a ground 0 viewing a satellite. The ratios of these positional uncertainties have been estimated by assuming plausible or limiting relations for the instantaneous density gradients in the statistically fluctuating atmosphere. The resulting estimated uncertainty of viewing a point on the ground directly beneath an aerospacecraft need be no larger than 10 cm. This value is essentially independent of altitude above about 32 kilometers. Hence, very high flying aircraft would have about the same observational-capability limits as satellites. The minimum required telescope objective diameter, however, to achieve this 10 cm resolution must be increased with craft altitude up to 1.9 meters at an altitude of 320 kilometers.

R 7

26,901

Bellman, D.R. & Matranga, G.J. DESIGN AND OPERATIONAL CHARACTERISTICS OF A LUNAR-LANDING RESEARCH VEHICLE. NASA TN D 3023, Sept. 1965, 50pp. National Aeronautics & Space Administration, Washington, D.C. (Flight Research Center, NASA, Edwards AFB, Calif.).

This paper presents the significant technical details and research capabilities of a free-flight lunar-landing simulator as they existed at the time of the initial flights of the vehicle. The lunar-landing research vehicle (LLRV) consists of a pyramid-shaped structural frame with 4 truss-type legs. A pilot's platform extends forward between 2 legs, and an electronics platform is similarly located, extending rearward. A jet engine is mounted vertically in a gimbal ring at the center of the vehicle. During a lunar-landing simulation, the jet engine remains essentially vertical, regardless of the attitude of the vehicle, and the jet thrust supports 5/6s of the vehicle's weight. The remaining 1/6th of the weight is supported by hydrogen-peroxide lift rockets which are mounted on the main frame and tilt with the vehicle. Thus, attitudes and accelerations are similar to those that will be experienced on the moon where gravity is 1/6th that on the earth. The pilot controls the descent by means of a manual lift-rocket throttle and the vehicle attitude by means of 16 attitude rockets and a complex electronic control system. The electronics give great versatility to the controls, which makes it possible to simulate a wide variety of nonaerodynamic vehicles. Suitable displays provide the pilot with vehicle attitude, altitude, velocities, and acceleration, in addition to pertinent information on the propulsion system.

R 16

26,902

Boisseau, P.C., Schade, R.O., Champine, R.A. & Elkins, H.C. PRELIMINARY INVESTIGATION OF THE HANDLING QUALITIES OF A VEHICLE IN A SIMULATED LUNAR GRAVITATIONAL FIELD. NASA TN D 2636, Feb. 1965, 25pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Hampton, Va.).

A flight-test investigation has been conducted in connection with the development of a lunar landing simulator to provide some preliminary information concerning the handling qualities of a tethered manned lunar-landing vehicle operating in a simulated lunar gravitational field. Proportional-type controls were used; no artificial stabilization was used during this investigation; and the results of the investigation are based entirely on pilots' opinions. The piloting task was visual hovering. The effect of a lunar gravitational field was considered to be well represented by the servocontrol system employed to maintain five-sixth of the weight of the vehicle and pilot. The arrangement of the pilot's controls was good and the control sensitivity was harmonious. Under these conditions the vehicle could be maneuvered fairly easily with reaction-jet controls, and the control power required in pitch, roll, and yaw was found to be somewhat higher than that required by helicopters and by the AGARD requirements for VTOL aircraft. Larger pitch and bank angles were required for linear acceleration of the vehicle than for acceleration of helicopters and VTOL airplanes, but for the small maneuvers used in these tests this large ratio of angle to acceleration was not particularly bothersome to the pilot. Height control of the vehicle with a vertical-acceleration capability of only 0.06g and no vertical-velocity damping was considered to be unsatisfactory for normal operation.

R 6

26,903

Suppes, P. & Donio, Jean. FOUNDATIONS OF STIMULUS-SAMPLING THEORY FOR CONTINUOUS-TIME PROCESSES. Contract AF49 (638) 1253, Proj. 9778 01, Tech. Rep. 69, Feb. 1965, 42pp. Mathematical Studies in the Social Sciences Institute, Stanford University, Stanford, Calif.

An extension of stimulus-sampling theory is provided for the two-response case where the response is given continuously in time. The reinforcements are given according to some time-dependent process. The particular instance of a Poisson-type non-contingent reinforcement schedule is thoroughly examined. The generalized axioms on which the theory is based are carefully analyzed and fundamental equations derived. Comparisons between this theory and the discrete trial theory are provided, which emphasize the similarities and differences between the results. Another extension to stimulus-sampling models which are continuous both in time and in the response state is then examined. Some sequential statistics are derived. Finally, the results from an actual experiment made at Stanford University are offered as an illustration of the theory.

R 5

26,904

Sorenson, R.C. LOGICAL MODEL REPRESENTING PERSONNEL FLOW IN THE U.S. ARMY: CONSIDERATIONS RELATIVE TO REDUCTION OF TURBULENCE. DA Proj. R&D PJ 2J024701A723, Tech. Res. Note 156, July 1965, 36pp. USA Personnel Research Office, Statistical Research & Analysis Lab., OCRD, Washington, D.C. (AD 621699)

A model representing the Army manpower system is suggested as one of a type which might be employed in an analytical approach to the problem of personnel turbulence. Various personnel policy alternatives may be evaluated in terms of turbulence reduction and manpower flow patterns. Attention is given to a hypothetical situation similar in some respects to the current Army manpower system and to possible antecedent restrictions responsible for officers being moved within or out of CONUS less than 24 months after previous PCS. It is felt that while no policy pronouncements are to come from this current effort, future applications with appropriate types of duty tours and actual allocation proportions would be promising in evaluating policy alternatives prior to implementation.

R 4

26,905

Glushkov, V.M., et al. CYBERNETICS AND PSYCHOLOGY. SUMMARY OF DATA. TT 65 64024, ATD Rep. P 65 78, Sept. 1965, 41pp. US Aerospace Technology Div., Library of Congress, Washington, D.C. (AD 621647)

This report is a collection of abstracts on the biological and psychological applications of cybernetics. Soviet popular-scientific periodicals published during the period 1959-1964 were reviewed for the materials which make up the report. All sources cited are available at either the Aerospace Technology Division of the Library of Congress or at the Collections of the Library itself. Abstracts on the following topics are included: a) Biocybernetics; b) Speech Recognition; c) Psychochemicals; and d) Hypnopedias.

R 31

26,906

Soong, T.T. ON A PRIORI STATISTICS IN MINIMUM-VARIANCE ESTIMATION PROBLEMS. J. Basic Engng., March 1965, 4pp. (Jet Propulsion Lab., California Institute of Technology, Pasadena, Calif.). (Reprint)

Simple general formulas are derived for investigating the effect of errors in a priori statistics on the minimum-variance estimates of linear regression parameters from observations obscured by noise. These formulas permit a direct evaluation of the covariance matrix of the errors of a posteriori estimates, showing the sensitivity to errors in a priori weighting matrix. A simple example illustrates that, for slight variations in the assumed a priori statistics, the calculated a posteriori error standard deviations of the estimates can deviate substantially from the correct values.

R 5

26,907

Obermayer, R.W. MEASUREMENT CRITERIA IN MAN MACHINE SYSTEMS SIMULATION. Contract NASw 869, NASA CR 257, July 1965, 21pp. National Aeronautics & Space Administration, Washington, D.C. (Bunker-Ramo Corporation, Canoga Park, Calif.).

This report describes simulation, models and games as analogies. They resemble in some way something else about which information is desired. We may therefore measure an analogy instead of the real-world object. Critical dimensions of analogies are the level of abstraction and the fidelity of simulation, however, if the object is to measure, the most critical aspect is the validity of measurement. Unfortunately, validity is not always a practical concept. Since the objective of measurement is to derive information, simulation studies are analyzed with respect to information objectives in the attempt to derive criteria for measure selection.

R 20

26,910

Kaplan, K.R. & Sklansky, J. ANALYSIS OF MARKOV CHAIN MODELS OF ADAPTIVE PROCESSES. FINAL REPORT MAY 1963-MARCH 1964. Contract AF 33(657) 11336, Proj. 7233, Task 723305, AMRL TR 65 3, Jan. 1965, 99pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Radio Corporation of America, Princeton, N.J.).

Learning and adaptation are considered to be stochastic in nature by most modern psychologists and by many engineers. Markov chains are among the simplest and best understood models of stochastic processes and, in recent years, have frequently found application as models of adaptive processes. A number of new techniques are developed for the analysis of synchronous and asynchronous Markov chains, with emphasis on the problems encountered in the use of these chains as models of adaptive processes. Signal flow analysis yields simplified computations of asymptotic success probabilities, delay times, and other indices of performance. The techniques are illustrated by several examples of adaptive processes. These examples yield further insight into the relations between adaptation and feedback.

R 14

26,911

King, S., et al. MARGINAL MAN AND MILITARY SERVICE. A REVIEW. PART I. Jan. 1965, 53pp. US Office of the Chief of Research & Development, Department of the Army, Washington, D.C.

This is the first of a two-part report about the usefulness in the Army of men classified as marginal. Based on a review of 8 principal programs or research studies conducted by the Armed Services, the emphasis in this report is on Army experience. The 6 studies conducted by the Army included one on basic education, 2 on Army school training and job performance of low scorers on AFQT, 1 on moral marginals, 1 on a major proposal to research the whole spectrum of marginal manpower, and a final study which surveyed all previous major efforts. The following are among the major conclusions of the report: a) Sufficient information is not available about the skills, knowledges, or other mental and physical requirements of Army jobs with respect to marginal men to permit authoritative statements about what marginals can and cannot do; b) There has been inadequate recognition of the importance of motivational problems as a major source of difficulty in the case of mental marginals; c) Training content and training methods for use with marginals have not been systematically explored nor have their results been determined; d) Appropriate control or comparison groups have been used only to study limited aspects of the problem; e) No satisfactory analysis has been made of the long range effects of the acceptance of marginal personnel by the Army in terms of cost, utilization and efficiency.

R 12

26,912

Fine, P.M. & Jennings, C.L. COPING AND DEVELOPMENTAL THEORY: APPLICABILITY TO SELECTIVE STUDY OF NORMAL MEN. Review 1 65, April 1965, 37pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

This report describes a practical way to identify adaptive modes of behavior. The subject is an important one to the Air Force because of routine personnel evaluations for reliability, aptitude, leadership, job training and sensoriperceptual conditioning. A result of a preliminary research was presented to show how coping devices may be observed, categorized, rated, and used in selection procedures. A tape-recorded clinical interview based on developmental theory obtained information about individual coping technics. The interview was independently evaluated by 3 psychiatrists using a rating list of coping devices. This list concretely demonstrated the application of developmental theory. A research proposal was presented to demonstrate how clinically derived developmental theory can also be adapted to statistical research. Significant questions regarding coping, ego functions, and events during development will yield significant findings. The research proposal utilizes a battery of psychologic tests to obtain estimates of ego strengths and coping styles and a questionnaire to obtain information about events during different developmental stages. Ratings of the psychologic tests and items included in the questionnaire were based on developmental theory. The results of a study of this type will provide baselines which should enable prediction of individual success in specific interpersonal and mechanical tasks.

R 28

26,913

Goodall, R.N., Lee, J.W., Vreuls, D. & Rheinlander, T.W. AIRCRAFT CONTROL TASK ALLOCATION. PHASE I. FEASIBILITY. Contract AF 33(615)2214, CDG Proj. 64 1A, Nov. 1965, 21pp. USAF Instrument Pilot Instructor School, Randolph AFB, Tex. (AD 474339)

12 S pilots flew 48 hooded ILS approaches to 50 ft. Shared and Standard Control of a T-29 equipped with a dual Force Wheel Steering Autopilot were compared. During Shared Control (24 approaches) one pilot flew pitch while the other flew roll. For the remaining 24 approaches, one pilot flew all axes under Standard Control. The purpose of the study was to examine the feasibility of the allocation of control tasks as a method to unburden the pilot in the event of partial autopilot failure. Recorded data indicated that Glide Slope, Localizer and Pitch Stability performance were equally good during Shared or Standard Control. Roll Stability was significantly better when control was Shared. Pilot workload was significantly reduced when control was Shared. After experimental flying the S pilots were enthusiastic about the concept. Results of this study indicate that sharing control tasks in this manner provides a definite advantage in terms of unburdening the pilot. This unburdening may provide a performance benefit for instrument flying below 50 ft; therefore, further research in this area will be conducted.

R 8

26,914

Roscoe, S.N. (Moderator). EDUCATION IN HUMAN FACTORS ENGINEERING. A SYMPOSIUM REPORT. Report from: "Ninth Annual Meeting, Human Factors Society, Dayton, Ohio, October 18-21, 1965." 1965, 40pp. Hughes Aircraft Company, Culver City, Calif.

The scope of this symposium was intentionally limited to the specific subject of requirements for and approaches to the education of human factors engineers. In the process of investigating the problem of providing human factors engineers to meet the identified needs of government and industry the following topics were discussed: a) definition of human factors engineering based on the concepts of Fitts, Williams, Grether & Chapanis; b) identification of the needs of government and industry for human engineers trained in the facts and methods implied by (a); c) examination of what government laboratories and industrial concerns are doing to meet their needs; d) description of the approach of the University of Michigan to the training of human factors engineers; e) outline of a more general and ideal solution to the problem. (HEIAS)

26,915

Merck, J.W. A MARKOVIAN MODEL FOR PROJECTING MOVEMENTS OF PERSONNEL THROUGH A SYSTEM. Proj. 7719, Task 771901, PRL TR 65 6, March 1965, 14pp. USAF Personnel Research Lab., Lackland AFB, Tex.

A large centrally controlled organization needs an accurate projection of future personnel requirements. A computer-processed mathematical model is developed which simulates movements of personnel through the system, with the movements based on empirically derived probabilities, the transition rates. Significant variables are selected--such as career field, length of service, grade--that distribute the system members in a vector of states upon which a probability matrix operates to produce the estimated distribution of personnel at the end of the next time interval--say a year. By iteration, the model can provide estimates for any number of years in the future. Proposed policy changes (e.g., accelerated promotions) can be entered into the system to forecast their effects. In establishing a model, the basic decision is the selection of variables that will characterize the members. The 1st requirement is that reliable input data be available for the current and preceding time intervals.

26,916

Harshbarger, J.H. & Basinger, J.D. TEST AND EVALUATION OF ELECTRONIC IMAGE GENERATION AND PROJECTION DEVICES. VOLUME III, EVALUATION OF PROJECTION SCREENS. FINAL REPORT JULY 1964-JULY 1965. Contract AF 33(615) 1889, Proj. 6114, Task 611405, AMRL TR 65 116, Dec. 1965, 66 pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Research Laboratories, Inc., Dayton, Ohio).

This report presents data from an evaluation of 7 types of projection screen surfaces to determine which surface best meets the requirements of visual simulation for astronautical flight training. In order to evaluate the various screen surfaces in terms of their brightness and the angle through which incident light is reflected, methods of measurement were devised which compared each screen to a given reference surface. 2 materials were tried as the reference surface, the traditional matte white surface of magnesium carbonate and a special type of white paint applied to masonite. The latter surface reflected the more uniform pattern of light, but proved difficult to duplicate due to the great care needed to apply the paint evenly. Thus the report recommends continued use of magnesium carbonate block as the standard reference for display screen measurements. The test data on the 7 screen surfaces indicates a wide variation in display characteristics. Apparently the user must accept an appropriate compromise between brightness and viewing angle--the more confined the viewing angle the brighter the display. It was also noted that flaws in the screen surface are particularly apparent in the more directive, brighter screen materials. It is thus essential that screens employing such materials be manufactured with extreme care.

26,917

Harshbarger, J.H. TEST AND EVALUATION OF ELECTRONIC IMAGE GENERATION AND PROJECTION DEVICES. VOLUME I, EVALUATION TECHNIQUE. FINAL REPORT JULY 1964-JULY 1965. Contract AF 33(615) 1889, Proj. 6114, Task 611405, AMRL TR 65 116, Aug. 1965, 39pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Systems Research Laboratories, Inc., Dayton, Ohio).

The report describes a method for evaluation of all types of displays in terms of resolution, brightness, and contrast ratio. The technique employs a television camera to replace human observation. This method thereby translates the characteristics of the display to measurable electronic waveforms. The waveforms are displayed on an oscilloscope where they may be analyzed directly and photographed, thus providing known standards of measurements in terms of electrical units rather than depending upon human judgment as a comparison standard. Direct evaluation may be applied to any display. The observer television camera furnishes data which are an expression of the display fidelity. Brightness is measured by a photometer. These terms are subsequently interrelated in an expression of the contrast ratio attainable at various resolution and brightness levels. The analytical evaluation, especially applicable to cathode ray tube (CRT) displays, obtains data through examination of the minute scanning spot as it traverses the image area. Analysis of the beam spot behavior enables one to predict the ultimate CRT capabilities without generating a complete display. Results of the analytical study are expressed so that they may be completely checked by application of the direct method to the full display. These methods of evaluation are adaptable to displays of every type as standard measurement technique.

R 3

26,918

Hartman, B.O. LECTURES IN AEROSPACE MEDICINE EXPERIMENTAL APPROACH TO THE PSYCHOPHYSIOLOGICAL PROBLEM OF MANNED SPACE FLIGHT. ca. 1965, 42pp. USAF School of Aviation Medicine, Brooks AFB, Tex. (AD 612636)

This paper describes the psychophysiological program being carried out at the School of Aviation Medicine; the 3 major areas are: weightlessness, Space Cabin Simulator, and analysis of dynamic behavior in the space cabin environment. The weightlessness studies have shown that the effects of short periods on biological functions, e.g., micturition, eating can be solved and on psychological functions, e.g., motor coordination, visual perception are relatively minor. However, prolonged exposure studies though exploratory in nature, indicate severely disturbed cardiovascular reflexes diminished muscle tone, and systematic minor changes in performance during water immersion (hypodynamic simulation) and gross disruptions in psychomotor behavior upon return to normal. The simulator work is in the problem areas of closed life-support systems, logistic support requirements, and psychomotor proficiency for prolonged periods; details of a 30-day simulated mission for a 2-man crew are described. The third part of the program is also in an exploratory phase; this consists of clinically oriented evaluations of dynamic behavior: pre- vs post-flight changes and aberrant behavior during flight, e.g., illusions, hostility, other personality disturbances. (HEIAS)  
R 35

26,919

Erickson, R.P., Doetsch, G.S. & Marshall, D.A. THE GUSTATORY NEURAL RESPONSE FUNCTION. J. gen. Physiol., Nov. 1965, 49(2), 247-263. (Psychology Dept., Duke University, Durham, N.C.).

With few exceptions, afferent neurons in the various sensory systems respond to wide ranges of stimuli. In those sensory systems for which the stimulus dimensions are understood, the response functions of these neurons may be described; they are usually simple functions with 1 maximum, although many variations exist. In the chemical senses, the stimulus dimensions are not known, and thus the neural response functions of these neurons have never been described. The present paper presents methods to determine these response functions and the stimulus dimensions for the chemical senses. A tentative response function for taste is developed, and preliminary steps are taken toward disclosing the stimulus dimensions.  
R 25

26,920

Ax, A.F., Beckett, P.G.S., Fretz, N.A. & Gottlieb, J.S. DEVELOPMENT OF A SELECTION TEST FOR MOTIVATIONAL APTITUDE. Contract NAS 21031, NASA CR 156, Jan. 1965, 46pp. National Aeronautics & Space Administration, Washington, D.C. (Lafayette Clinic, Detroit, Mich.).

This study is the 1st stage in the development of a test for motivational aptitude. It is based on the hypothesis that the aptitude for acquiring the social motives ranges widely in the population from the lowest in schizophrenia and the hobo type to the highest in the most productive people. The criterion groups first examined are successful college students and professional people contrasted to chronic schizophrenic patients and skid row habits. All motives are largely mediated through the physiological systems controlled by the autonomic nervous system. The procedure used therefore is the acquisition of a conditioned (learned) response of the autonomic nervous system; namely, the classical conditioning of the palmar sweating response (GSR). Results on 19 control Ss and 28 schizophrenic patients and a skid row habitue showed the patients and skid row S to be essentially lacking in the ability to learn the association between the tone (CS) and the pain stimulus (UCS) by producing a GSR to the tone after some 30 training trials. In contrast, the healthy group made this association readily as revealed by the frequency, consistent latency and amplitude of GSR responses to the tone alone. Conclusions are that Physiologic Learning Aptitude (PLA) which is believed to be a measure of the ability to acquire the secondary or social motives can be measured by this conditioning procedure. With further documentation and streamlining, this procedure should have a valuable application for the selection of highly adaptable persons who can be readily trained or conditioned for high-stress tasks such as space flight.  
R 22

26,921

McGee, V.E. AFFECTIVE COMMUNICATION IN SPEECH AND RELATED QUANTITATIVE PROBLEMS. FINAL REPORT, 15 APRIL 1963-14 APRIL 1965. Contract NONR 3897(05), July 1965, 34pp. Dartmouth College, Hanover, N.H. (AD 620333)

The over-all orientation of this research project was to investigate by various means those kinds of information in speech which do not deal directly with the actual verbal message per se. The name given to this non-verbal information is "affective information". Initially, this interest was inspired by the work done at the Bell Telephone Laboratories on the Articulation Index. This work attempted to make use of the physical information in the speech signal. Intelligibility as here defined is synonymous with fidelity of transmission since the S's response is merely a repetition of the perceived input signal. With respect to affective information the goal has been to identify as far as possible the acoustical properties of the speech signal which are identified with various perceptual responses to that speech signal. The first non-verbal aspect that was considered was "speech quality". Since this concept is of considerable importance both in the technology of speech processing developments and from a psychological point of view, various attempts at defining psycho-acoustical correspondences have been made during the term of this project.  
R Some

26,922

Sjoberg, L. AN ATTEMPT TO USE RATINGS TO STUDY THE FAVORABLENESS OF HYPOTHETICAL OFFERS TO GAMBLE. Number 200, Dec. 1965, 14pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

In 2 experiments an attempt was made to analyze ratings of favorableeness of offers to gamble in the general framework of the theory of SEU (Subjectively Expected Utility) maximization. The offers were rated both as unfavorable and favorable. Component analyses showed that all data matrices were well accounted for by 2 components, as predicted by SEU theory. Inspection of these components showed, however, that they in many respects could not be easily accounted for by classical thinking. Negative utilities of money occurred, as well as negative subjective probabilities. There was also a strong tendency to evaluate offers not as a function of the product of utility and subjective probability but of their sum.  
R 17

26,923

Zhirninskaya, Ye.A. & Ioselevich, F.M. EFFECT OF VESTIBULAR IRRITATION ON ELECTRICAL ACTIVITY OF THE CORTEX AND BASAL AREAS OF THE BRAIN. FTD TT 65 410/1+2+4, Aug. 1965, 21pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Vestnik Oto-Rino-Laringologii (Russian), 1951, 13(2), 17-24). (AD 620503)

Relative investigation of electrical activity of cortical and basal sections of the brain revealed certain additional characteristics in the nature of the basal electrogram in comparison with the previously described ones. Vestibular irritation causes considerably greater changes in the bioelectric activity of the brain than other afferent irritations. Electric response to irritation of the vestibular apparatus can be picked-up from all areas of the cortex cerebri and in a majority of cases appears to be two-sided and symmetrical. Responsive reaction to vestibular irritation is much brighter, more intensive, and longer lasting, than in the cortex cerebri. The obtained data, indicating considerable functional displacements in the electrical activity of basal sections of the brain under the effect of vestibular irritation, gives some basis for the assumption that in illnesses of the central nervous system the changed nature of its reactivity may be easier to detect with the aid of the mentioned afferent irritation.

R 7

26,924

Ronken, D.A. A NOTE ON SOME ALTERNATIVE MODELS FOR RESPONSE BIAS CHANGES DURING FORCED-CHOICE DETECTION EXPERIMENTS. Contract NONR 477(34), PLR 13N, Nov. 1965, 10pp. University of Washington, Seattle, Wash.

Several variants of a learning model for forced-choice detection experiments (Atkinson & Kinchla, 1965) may be produced by making various reasonable assumptions regarding which events are effective in producing response bias changes. Atkinson & Kinchla assumed the bias changed according to a single parameter stochastic learning mechanism, such changes occurring only when no signal was detected. An alternative formulation uses 2 learning parameters and postulates the bias changes on every trial, but at different rates, according to whether or not the signal is detected. This 2-parameter bias model was applied to the original data (Atkinson & Kinchla, 1965), and produced numerical estimates of the parameters which confirm the conjecture that the bias changes principally during non-detection trials. In addition, the parameter estimates indicate that the relative effectiveness of information feedback is determined by its relative frequency of occurrence, an interpretation which was not possible from the single-parameter model.

R 5

26,925

Zajonc, R.B. & Sales, S.M. SOCIAL FACILITATION OF DOMINANT AND SUBORDINATE RESPONSES. Contracts NONR 1224(34) & NSF Grant GS 629, Proj. NR 170 309, Tech. Rep. 33, Sept. 1965, 15pp. Groups Dynamics Research Center, University of Michigan, Ann Arbor, Mich. (AD 620681)

The purpose of this study was to examine the effects of an audience on the emission of dominant and subordinate responses. A procedure previously found sensitive to drive effects was employed. It was predicted that response emission in the pseudo-recognition task would be characterized by an interaction between habit-strength and audience-variables. Responses that were highly trained were found to benefit from the presence of an audience, while responses that received minimal training were found to suffer. (HEIAS)

R 17

26,926

Obermayer, R.W. & Muckler, F.A. ON THE INVERSE OPTIMAL CONTROL PROBLEM IN MANUAL CONTROL SYSTEMS. IEEE International Convention Rec., 1965, 6, 153-165. (Bunker-Ramo Corporation, Canoga Park, Calif.). (Reprint)

Optimal control theory is briefly reviewed with particular emphasis on the inverse problem of finding the conditions under which a given system is optimum. A specific method for computing the optimal performance weighting coefficients is developed. While the data are inconclusive, application of this technique to some of the mathematical models of manual control systems existing in the literature reveal some intractability with theory, but with the suggestion that some observed trends in the data are consistent with a hypothesis of optimizing human operator behavior. Some implications to manual control theory and experimental methodology are derived.

R 22

26,927

Frost, G.C. & McCoy, W.K., Jr. A "PREDICTOR" DISPLAY FOR ON-BOARD RENDEZVOUS OPTIMIZATION. Proc. National Electronics Conference, 1965, XXI, 683-688. (USAF 6570th Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio & Ritchie, Incorporated, Dayton, Ohio). (Reprint)

To date the predictor concept has been shown to have great promise as a rendezvous display technique. We have shown that, provided the model is sufficiently good and the input data are sufficiently good, operators can rapidly be trained to fly successful rendezvous missions. We have shown that with the addition of 2 simple off-line or trial controls, operators can determine a near-optimum trajectory and implement that trajectory for near minimum fuel consumption. Additional work is in progress to determine how good the input data and the model must be, or conversely, how poor they can be without degrading the effectiveness of the system. Additional work is needed to determine display devices other than CRT's that might be applicable to the predictor display and to determine how the prediction computer might be miniaturized. Tentative plans in both of these areas are being formulated.

R 7

26,928

McCoy, W.K., Jr & Frost, G.G. INVESTIGATION OF "PREDICTOR" DISPLAYS FOR ORBITAL RENDEZVOUS. PROGRAM SUMMARY. FINAL REPORT NOVEMBER 1963-OCTOBER 1964. Contract AF 33(615) 1089, Proj. 7184, Task 718402, AMRL TR 65 138, Sept. 1965, 28pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Ritchie, Incorporated, Dayton, Ohio).

A series of studies on the development of predictor display techniques for orbital rendezvous is summarized. The purpose of this program was to evaluate alternative predictive display techniques for orbital rendezvous. After an analog simulation of the rendezvous problem was mechanized and a display format developed, 2 studies were conducted investigating operator efficiency at control of rendezvous utilizing the side looking display format and predictor display techniques. Also, 2 display modifications were investigated: a reduced display size and, the addition of a braking circle. The results of the initial work indicated that operator performance in manual control of rendezvous maneuvers was enhanced by predictor display techniques. The final section of the report outlines the plans for follow-on efforts.

R 2

26,929

Ivanov-Muromskiy, K.A., et al. THE APPLICATION OF MATHEMATICAL METHODS IN AVIATION AND SPACE MEDICINE. CONFERENCE, MOSCOW, FEBRUARY 25-26, 1965. (SUMMARY OF REPORTS). NASA TT F 374, Sept. 1965. National Aeronautics & Space Administration, Washington, D.C. (Transl: Akademiya Nauk SSSR, Voenno-Vozdushnyye Sily, Moscow, 1965).

The reports herein summarized include: electronic digital computer application for analyzing bioelectric activity of the brain; phonocardiographic material analysis via punched cards; equipment solutions for the analysis of the generated reply; input devices for automatic (computer) analysis of physiological characteristics; mathematical techniques in analyzing physiological characteristics; comprehensive analysis of EEG's; standardization of computer processing of biomedical data; equipment system for investigation of cardiac action; determination of characteristics for optimum treatment of cardiac disorders; correlation methods for investigation of cardiovascular system; automatic processing of respiratory, circulatory, and other activities recordings; dispersion method for physiological data evaluation; control systems and computer technology; operator transfer function measurement; etc. (HEIAS)

26,930

Budai, D.M. & Dawkins, G.E. SPECIFICATION FOR SOUTHERN CROSS TECHNICAL MANUALS. Problem SS 296 0012, Task 11012 (NEL J5 5), NEL Rep. 1329, Oct. 1965, 110pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

This specification sets forth the U.S. Navy Electronics Laboratory requirements for the development, production, and updating of technical manuals for the operation and maintenance of systems and equipments comprising the Naval Ships Advanced Communications Systems (NSACS), otherwise known as Southern Cross or Project SS 296. Manuals resulting from the requirements of this specification are intended to fulfill requirements for logistic support, engineering support, and training support of systems and equipments. The specification not only covers technical manuals, per se; it encompasses other forms of documentation.

26,931

Hannigan, F.J. THE DESIGN OF AIR CUSHION VEHICLE AUTOMATIC AND SEMI-AUTOMATIC CONTROLS. FINAL REPORT. BuShips Code 632B, NO(bs) 92050, SS215 000, Task 10302, Rep. U411 65 032, July 1965, 71pp. Electric Boat Div., General Dynamics Corporation, Groton, Conn. (AD 620144)

This report presents a practical technique for designing automatic and semi-automatic (quicken) control systems for air cushion vehicles (ACV's). These systems have been designed to minimize a major problem in ACV control, vehicular sideslip. General equations of 5° of freedom of ACV dynamic operation are included from which a mathematical model can be derived; this derivation is also included. The design technique is valid for most vehicle configurations and examples of its application are included for 3 different control methods. The quickened concept is explained and results of its usage are included. Analog computer data is presented for turning maneuvers at the operating conditions for which the systems were designed as well as at off-design points. From the study that preceded this report it was concluded that an automatic, or a quickened, control system for an ACV offers distinct advantages over conventional manual control, particularly in minimizing sideslip and establishing and maintaining a command heading.

R 3

26,932

Sjöberg, L. ROTATION TO A HYPOTHESIS OF CONSTANT FACTOR LOADINGS. Number 180, Jan. 1965, 12pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

A rotation method is derived which maximizes the fit to a hypothesis of constant loadings in one factor in the least-squares sense. Extensions to cases of higher dimensionality are discussed and an application of the method to categorical judgment data is presented.

R 10

26,933

Roberts, R.A. THEORY OF SIGNAL DETECTABILITY: COMPOSITE DEFERRED DECISION THEORY. Contract Nonr 1224(36), Task 187 200, CEL Tech. Rep. 161, Rep. 3674 5 T, March 1965, 217pp. Cooley Electronics Lab., University of Michigan, Ann Arbor, Mich. (AD 614480)

A general theory is presented for the solution of practical problems in the sequential detection of composite signal hypotheses. The theory specifies the optimum stopping rule needed for the sequential detector and the dependence between the O's opinion of the cause of the reception and the distribution of the unknown signal parameters. The general theory implies the information that must be extracted from the observation is the likelihood ratio and the a posteriori signal parameter distribution. The form of the optimum detector, derived from the general theory, must include an adaptive capability, so that the signal parameter distribution can be sequentially updated. Applications of the general theory to a signal of unknown phase and a signal of unknown amplitude are presented. The numerical results include: a) optimum receiver designs for both sequential and nonsequential observation procedures; b) evaluations of the optimum receivers in terms of error performance and average observation time; and c) comparisons of optimum sequential and nonsequential detectors. The unknown amplitude problem results in several new conclusions. Some of the more important are: a) as signal uncertainty increases, the average observation time and range of a priori opinions for which it is profitable to observe, decreases; b) the savings of sequential procedures over nonsequential procedures is primarily in error performance rather than observation time; c) due to the large signal uncertainty of unknown amplitude, the optimum detector must observe for long periods of time to obtain acceptable detection performance; and d) the graph of the optimum decision boundaries and the mean-motion trajectories of different signal amplitudes can be used as a good approximate method for describing the operation of the optimum sequential detector in the unknown amplitude problem.

R 24

26,934

McRuer, D.T., Graham, D., Krendel, E. & Reisener, W., Jr. HUMAN PILOT DYNAMICS IN COMPENSATORY SYSTEMS. THEORY, MODELS, AND EXPERIMENTS WITH CONTROLLED ELEMENT AND FORCING FUNCTION VARIATIONS. FINAL REPORT. Contract AF33(616) 7501, Proj. 8219, Task 821905, AFFDL TR 65 15, July 1965, 194pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Systems Technology, Incorporated, Hawthorne, Calif.).

The description of human pilot dynamic characteristics in mathematical terms compatible with flight control engineering practice is an essential prerequisite to the analytical treatment of manual vehicular control systems. The enormously adaptive nature of the human pilot makes such a description exceedingly difficult to obtain, although a quasi-linear model with parameters which vary with the system task variables had been successfully applied to many flight situations. The primary purposes of the experimental series reported are the validation of the existing quasi-linear pilot model, and the extension of this model in accuracy and detail.

R 60

26,935

Bliss, J.C. (Proj. Dir.). EXPERIMENTS IN TACTUAL PERCEPTION. Contracts NAS 2 1679 & AF 33(615) 1099, Proj. 4160, Task 416001, AFAL TR 65 75, July 1965, 197pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Stanford Research Institute, Menlo Park, Calif.). (AD 470828)

This report describes basic studies on tactile perception and communication; there are 5 main sections (II-VI). In II words, sentences, and paragraphs were transmitted to Ss by tactile display consisting of arrays of airjet and piezoelectric bimorph stimulators programmed so the alphabetical patterns moved across much the same as certain news display boards. Ss read tactually from these at 20 words/min. after less than 20 hrs. training. The size of the stimulator array and the effect of type font were considered. In III a specially designed tactile alphabet was tested. In IV 2-dimensional compensatory tracking with a continuous and a discrete visual display, and a discrete tactile display was studied; performance with the 2 types of discrete displays was found to be approximately equal, though generally poorer than with the continuous visual. In V a series of phenomenological observations is described: apparent position, apparent motion, and illusions. Finally, in VI deliberate stimulus "jitter", methods of transmitting magnitude, and ability to discriminate among stimulus loci were reported. (HEIAS)

R 50

26,936

Künnäpas, T.M. INTENSITY OF THE UNDERLYING FIGURAL PROCESS. Number 197, July 1965, 13pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

A simple scaling technique is described by means of which proportions of frequencies may be transformed to scale values representing the intensity of the perceptual process. This technique is applied to data from experiments on directly observable figural fluctuations. The intensity of the underlying figural process is defined by a sine function with amplitude damping. Very good agreement between theoretical and empirical values demonstrates the applicability of the proposed method.

R 26

26,937

Künnäpas, T.M. A NOTE ON RATIO ESTIMATION. Number 198, Oct. 1965, 6pp. Psychological Labs., University of Stockholm, Stockholm, Sweden.

Individual matrices of ratio estimates, obtained in 4 experiments, were analysed. It was shown: a) that the subjective range of scales derived from such matrices depends on the individual "level of estimation"; and b) that the relation between the scales representing low and intermediate level of estimation is a power function and the relation between the scales from high and intermediate levels is logarithmic or possibly linear.

R 6

26,938

Bolin, S.F., Sadacca, R. & Martinek, H. TEAM PROCEDURES IN IMAGE INTERPRETATION. DA Proj. R&D PJ 2J620901 A721, Tech. Res. Note 164, Dec. 1965, 38pp. USA Personnel Research Office, Support Systems Research Lab., OCRD, Washington, D.C. (AD 480533)

Present study was one in a series concerned with the development of effective image interpreter team techniques and organization. 10 different team procedures were compared with each other and with individual interpreters on 8 performance tests based on photography from 4 aerial surveillance missions of World War II and 4 mission flown during the Korean war. Degree of cooperation and working methods were systematically varied in 80 matched teams of 2 or 3 Army image interpreters. Rights and wrongs scores were based on a consensus of either 2 or 3 team members. 3-man teams, with individuals working independently, proved consistently superior to the average individual interpreter attaining the same level of completeness as the average individual with substantial increases in accuracy. On the 8-mission performance tests used in this experiment, the 3-man independent teams had average accuracy scores ranging from 52% to 100% vs 12% to 39% for the average individual. 2-man independent teams also showed gains in accuracy but with reduced completeness compared with individual performance. Fully cooperative 3-man teams were the only ones to show gains in completeness while maintaining the same accuracy rate as individuals, but this improvement was attained only for the more difficult World War II missions. Absolute levels of performance, as in prior research, were low on the average and highly variable for both individuals and teams. Performance was shown to depend on the requirements of particular mission performance tests.

R 19

26,939

Taylor, M.M. & Fraser, W.C.G. A TABLE OF  $d'$  FOR A MODEL OF THE UNFORCED CHOICE EXPERIMENT. DRML Rep. 534, June 1965, 27pp. Defence Research Medical Labs., Toronto, Ontario, Canada.

Tables of  $d'$  have been published by Elliott (cf. HEIAS 15,409) and reprinted by Swets (cf. HEIAS 24,097). These tables apply to either of 2 experimental conditions: a) The observer has to decide whether or not a particular interval contained a signal; b) knowing that a signal did occur, the observer must decide which of 2 or more intervals contained it. The present table applies to a model of an intermediate condition: the observer must decide in which of 2 intervals a signal was given if one was actually presented. 3 responses are available: "Interval 1," "Interval 2," "No decision." The present table may be used directly to evaluate the detectability of signals presented in the unforced choice experiment, but an acquaintance with the concepts of signal detection theory is required for an understanding of the discussion. A summary is provided in Elliott's tables.

R 5



26,940

Vineberg, R. HUMAN FACTORS IN TACTICAL NUCLEAR COMBAT. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Tech. Rep. 65 2, April 1965, 90pp. Human Resources Research Office, George Washington University, Alexandria, Va.

The general objectives of this study are to gather information that may provide bases for predicting human behavior in nuclear warfare, to analyze this information for implications concerning possible preparation for such warfare, and to develop a means for estimating the psychological casualties that are likely to occur on the nuclear battlefield. Part I is a description and analysis of man's response to extreme stress, based on a review of relevant literature. Part II is a description of a method developed for estimating the extent of psychological casualties to be expected in tactical nuclear combat. It is concluded that man can, in general, cope with the severest forms of stress in civilian and military life. Nevertheless, because the greater and continuing stresses of nuclear combat may increase neuropsychiatric casualties, implications are that special training, given simultaneously with his training in specific skills and knowledges, would prepare the soldier to fight and survive in a nuclear environment.

R 85

26,941

Moreland, J.B. ACOUSTICAL EVALUATION OF THE LANCE MISSILE SYSTEM. AMCMS Code 5243.12.12500, Tech. Memo. 5 65, May 1965, 86pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 470430)

The noise of a moving LANCE will inflict a temporary threshold shift on personnel riding in the vehicle. The amount of TTS depends, in general, on vehicle speed and duration of the exposure--TTS increases with faster speeds or longer exposures. Under the operating conditions HEL considers normal--speeds less than 30 mph and exposure less than 2 hours--TTS will not cause a problem in communication after the noise stops. Personnel leaving the vehicle should be able to understand each other, despite the TTS, simply by raising their voices. The vehicle's noise at speeds of 20 mph or more exceed HEL Standard S-1-63B. Personnel repeatedly exposed (one to 2 hours per day for 3 years) to the noise levels at these speeds may suffer a permanent hearing loss. HEL feels that any piece of AMC equipment that produces noise levels which exceed HEL Standard S-1-63B in personnel-occupied spaces creates an acoustically hazardous condition. Noise levels around the stationary vehicle during missile transfer are not hazardous and will not cause excessive loss in auditory acuity (that is, a loss that would adversely affect performance of other operations). However, the intelligibility tests results indicate that the Crane Operator and Section Chief will not be able to communicate by unaided voice.

R 9

26,942

Baker, P.T. & Angel, J.L. OLD AGE CHANGES IN BONE DENSITY: SEX, AND RACE FACTORS IN THE UNITED STATES. Hum. Biol., May 1965, 37(2), 104-121. (Pennsylvania State University, University Park, Penn. & US National Museum, Washington, D.C.).

This study was designed to provide normative data on the density of specific bone segments in the human skeleton. Samples of bone were taken from 48 cadavers. These cadavers were obtained from Philadelphia medical schools and were shown to be from a section of the U.S. population which had a greater amount of malnutrition and alcoholism than normal. The sample included both males and females of both European and African ancestry. The individuals were all more than 40 yrs. of age at death and a majority were over 65. The density of the bone segments were measured using a specific gravity technique and the quantitative relationship between bone mineral content and bound protein was determined by ashing at 600° C. The results of the study suggest that the density of 1 part of the skeleton is not a good index of density in other parts. They also indicate: a) that whole segments of the Negro male skeleton tend to be denser than the white male segments; b) in Whites and Negroes over 40 the female had uniformly lower bone densities and this lower density was entirely related to lower mineral content. Protein content per unit of volume was not different. Most unexpected was the failure to find uniformly lower densities with increased age. However, some association between age and density was encountered in some bone segments.

R 18

26,943

Ward, Joan S. WEIGHTS, HEIGHTS AND CHEST CIRCUMFERENCES OF ENGLISH EAST MIDLAND COAL MINERS IN 1952-62. Hum. Biol., Sept. 1965, 37(3), 299-311. (Ergonomics & Cybernetics Depts., Loughborough College of Technology, Loughborough, Leicestershire, England).

The recorded stature, body weight and chest girth of 2,160 coal miners have been analysed. The only significant difference in body measurements between men employed underground or on surface or born in different areas was that miners working on surface, who were heavier than underground miners in the same age group. M stature increases from 165.3 cm at 15.5 yrs. old to the maximum recorded (174.1 cm) at 24.5 yrs. A significant decline in stature (to 169.7 cm) is apparent only in the 40-44 yr. old age group. Reasons are given for thinking this decline to be a result of war service selection. Body weight and chest circumference increase from 54.8 kg and 81.2 cm respectively at 15.5 yrs. old to 70.7 kg and 92.8 cm at 24.5 yrs. old. A further, but not significant, increase in these measurements is observed up to 72.3 kg and 94.4 cm in the age group 45-49 yrs. M maximum stature is calculated to be 172.7 cm attained by the latest maturing between their 19th and 20th birthdays. Comparison with previous data on British miners and industrial workers over the same age range shows that the miners in this study are significantly taller and heavier. The secular trend of maximal adult height in this working group appears to have been about 2.5 cm from 1929/1932 to 1952/1962.

R 13

26,944

Bullen, B.A., Quaade, F., Olesen, E. & Lund, S.A. ULTRASONIC REFLECTIONS USED FOR MEASURING SUBCUTANEOUS FAT IN HUMANS. Hum. Biol., Dec. 1965, 37(4), 375-384. (Bispebjerg Hospital, Copenhagen, Denmark).

A technique based on the reflection of ultrasonic waves from the interface between subcutaneous fat and the deep fascia has been used to measure the thickness of subcutaneous fat-plus-skin in human Ss. The agreement between repeated measurements was good, reliability coefficients at the triceps, subscapular and abdominal sites being 0.98, 0.98 and 0.99, respectively. The results were compared with those obtained by skinfold caliper and needle puncture. The correlation coefficient between needle puncture and ultrasonic measurements at the abdominal site on a subsample of patients was 0.98. Skinfold caliper thicknesses and ultrasonic depths at the triceps and abdominal sites were compared separately for the 51 men and 49 women. Correlations obtained between these measurements at the triceps were 0.80 and 0.80 for the men and women, respectively and corresponding coefficients were 0.90 and 0.85 at the abdominal site. The median value of the compressed skinfold at the abdominal site was 66% of the uncompressed ultrasonic equivalent for both men and women and at the triceps site was 61% for the men and 67% for the women.

R 20

26,945

Sataloff, J., Vassallo, L. & Menduke, H. TEMPORARY AND PERMANENT HEARING LOSS: A TEN-YEAR FOLLOW-UP. Arch. environ. Health, Jan. 1965, 10(1), 67-70.

In an 11 year follow up study on 33 Ss who had participated in a series of auditory experiments in 1951, the following conclusions were reached: a) there is no apparent relationship between temporary threshold shift (TTS) produced experimentally by exposure to a pure tone and permanent threshold shift (PTS) in employees exposed for 11 years to average daily noise levels of 90 db overall with a maximum of about 85 db in any of the 3 octave bands between the frequencies 300-2400; b) noise-induced hearing loss does not seem to be progressive in personnel who worked for 11 years with reduced daily maximum noise levels of about 85 db in any of the 3 octave bands between 300 to 2400. Ss with normal hearing showed no evidence of noise-induced PTS in such an environment.

R 6

26,946

Andrews, G.A. & Cloutier, R.J. ACCIDENTAL ACUTE RADIATION INJURY. THE NEED FOR RECOGNITION. Arch. env. Health, March 1965, 10(3), 498-507. (Medical Div., Oak Ridge Institute of Nuclear Studies, Oak Ridge, Tenn.).

The probability of serious exposure to radiation that will produce acute symptoms is exceedingly small as shown by past history. However, the increased use of radiation makes it desirable that physicians be acquainted with the symptoms and management of acute radiation exposure. This paper summarizes for the physician who may not be familiar with them, the various types of acute exposure that are possible and the signs and symptoms that may be observed. Usually whether a radiation exposure has been or could have been received will be known. The possibility that an unknown exposure to radiation may occur is real, and in this situation skill and awareness are needed for a correct diagnosis. Early diagnosis will provide a basis for treatment and will permit the discovery of other persons who may also have been exposed; most important, it will permit the elimination of the source of exposure.

R 31

26,947

Stokinger, H.E. INDUSTRIAL CONTRIBUTION TO THRESHOLD LIMIT VALUES. Arch. env. Health, April 1965, 10(4), 609-611. (US Department of Health, Education, & Welfare, Washington, D.C.).

On the premise that the Threshold Limit Values (TLV) are industry's values, industry should be concerned about taking a predominating role in accumulating firm data that will help in developing TLVs. A review of the approximately 350 substances listed in the TLVs for 1964 shows that industry or industry-sponsored efforts account for 90, or about 25% of the total. Several ways in which industry can direct the efforts of medical and industrial hygiene departments for the development and improvement of industrial air standards are suggested: a) animal experiments; b) human experiments in which the volunteers are "acclimated" to the test substance; and c) in-plant studies--studying workmen on the job in association with proper measurements of environmental factors. The latter is felt to be the most valuable information that industry can contribute if they observe the following conditions: The group of workmen under investigation should be carefully selected as to size. Exposure should be restricted to a single test substance. In addition, careful measurement of the environmental air contaminant should be made at breathing-zone levels and adequate medical information should be obtained about the workmen through application of appropriate clinical and physiological studies. (HEIAS)

R 13

26,948

Michael, P.L. EAR PROTECTORS. THEIR USEFULNESS AND LIMITATIONS. Arch. env. Health, April 1965, 10(4), 612-618. (State College, Penn.).

This paper discusses the usefulness and limitations of ear protectors. Individual ear protectors in general use are either plug- or muff-types. The insert-type protector attenuates noise by plugging the external-ear canal. The muff-type protector encloses the auricle of the ear and provides an acoustical seal against the head. The author distinguishes between various types of insert and muff protectors, presenting the advantages and disadvantages of different construction materials. The attenuation characteristics of the ear protectors discussed are given. The following topics are briefly reviewed in the report: the amount of ear-protection required; communication in a noisy environment; and the process of measuring the attenuation provided by ear protectors. The article concludes with a discussion of the factors involved in a successful ear protection program. It is suggested that: a) a nurse or doctor should take part in the program so they can explain the purposes and do the fitting properly; b) personnel should use the plugs for short periods to start and gradually work up to longer periods; c) the "supervisor" try the plugs first whereupon he will realize the value of the protection and will be convinced that required use by the employees is not unreasonable. (HEIAS)

R 20

26,949

Ham, J.F. USE OF A VORTEX TUBE IN SAFETY CLOTHING. Arch. env. Health, April 1965, 10(4), 619-623. (Mine Safety Appliances Company, Pittsburgh, Penn.).

Convected heat, "heat build-up" inside safety clothing worn in high ambient temperatures, has defied practical solution. This paper reports the development of a compact, efficient vortex tube which promises to provide some answers to this problem. A table gives typical performance of a commercially available vortex tube under various theoretical air pressures and settings. The vortex tube performs an absolute temperature conversion on input air. The following topics are discussed: a) the vortex tube in use; b) flow and pressure characteristics; c) heat hazard from tube and hot exhaust; d) noise; e) air distribution. The article concludes with several suggestions for possible future uses of the vortex tube. (HEIAS)

26,950

Hall, W.H., Barila, T.G., Metzger, E.C. & Gupta, K.K. A CLINICAL STUDY OF ACUTE MOUNTAIN SICKNESS. Arch. env. Health, May 1965, 10(5), 747-753. (USA Research Institute of Environmental Medicine, Quartermaster Research & Engineering Command, Natick, Mass.).

Acute mountain sickness results from hypoxia, but the pathophysiology remains obscure. Some persons experience symptoms at elevations as low as 6000 ft. above sea level. Virtually all unacclimatized persons transported rapidly to altitudes of 15,000 ft. or higher are affected. The cardinal manifestations are headache, breathlessness, and impaired capacity for exertion. These may be so severe and affect a large proportion of exposed persons, that the effective performance of an unacclimatized group taken rapidly to high mountain altitudes will be markedly impaired. There is rapid clinical improvement, but full recovery of work performance equal to that at sea level is achieved slowly, if at all. Observations were made in a group of 20 unacclimatized soldiers taken within 24 hrs. from sea level to a camp in the Himalayas at 17,000 ft. All experienced acute mountain sickness. The peak in incidence and severity was 48 hrs. after arrival at altitude. At this time, 18 of the 20 men were sufficiently ill that their overall performance capability was judged grossly impaired. There was rapid improvement, with only 5 such cases remaining on the 5th day. A moderate oral supplement to normal dietary potassium intake has been reported as preventing or ameliorating acute mountain sickness. Half of the 20 men studied received a dietary supplement providing 60 mEq of potassium daily. Illness in these men, however, was at least as severe and persisted at least as long as in the others who received a glucose placebo.

R 30

26,951

Rustagi, J.S. MATHEMATICAL MODELS OF BODY BURDEN. Arch. env. Health, May 1965, 10(5), 761-767. (Mathematics Dept., Ohio State University, Columbus, Ohio).

The concept of "body burden" in the study of effects of environmental pollutants on human health is very important. Body burden is defined as the level of such a pollutant in the organs, blood, plasma, or other body fluids of an organism, which produces or is capable of producing damage or significant interference with body functions or those of organs or tissue. The evaluation of body burden of trace substances is also important in many other contexts. Considerable attention to various experimental aspects of determining exposures to various trace substances has been given. There are extensive studies on uptake and excretions of many substances. Interest in these studies is evident from a partial bibliography at the end of this paper. In surveying the literature, attention was restricted to recent periodicals in the environmental sciences. Most studies are concerned with statistical evaluations and have assumed directly or indirectly a mathematical model. Studies using a mathematical model explicitly are few. An attempt is made here to review the mathematical study of the phenomenon of storage and to suggest some possible extensions. Deterministic and stochastic models of this phenomenon are presented with application to Kehoe's lead chamber data.

R 64

26,952

Wilson, C.L. WILEY POST: FIRST TEST OF HIGH ALTITUDE PRESSURE SUITS IN THE UNITED STATES. Arch. env. Health, May 1965, 10(5), 805-810. (USAF Systems Command, Andrews AFB, Md.).

3 different high altitude suits were designed and tested for Wiley Post. The report contains a photograph of each of these 3 suits. 2 low pressure chamber tests were conducted using the final suit. These represent the 1st United States tests of a human Ss in a high altitude pressure suit at low barometric pressures. Post employed his suit on at least 10 and possible 17 flights and used liquid oxygen on all such flights.

R 12

26,953

Robinson, K.E. EVAPORATIVE COOLERS, THEIR PLACE IN MODERN INDUSTRY. Arch. env. Health, April 1965, 10(4), 631-634. (General Motors Corporation Technical Center, Warren, Mich.).

The problem of providing a comfortable environment for the industrial worker need not involve costly, elaborate equipment such as complete air-conditioning systems which are often impractical and frequently unsatisfactory. In the majority of industrial plants, regardless of geographical location, the environment can be improved by the use of a simple, economical evaporative cooler, properly selected and properly installed. In the use of evaporative coolers all efforts are directed toward reducing the effective temperature to which the individual is exposed rather than toward trying to absorb the heat gain of the building as in conventional air-conditioning design. Emphasis is on the basic principle that, whenever air temperature is maintained below skin temperature, the body can lose heat by convection and relative humidity is not particularly important. Evaporative coolers are being used successfully for manufacturing plants in a number of communities, for example, in Dayton, Ohio, Lansing, Mich., & St. Louis, Mo. This equipment has been effective in addition to being practical and economical to install and operate. The evaporative cooler is not a cure-all but, when properly used, is a valuable and economical aid for industry's avowed interest in providing a more satisfactory working environment for employees.

R 4

26,954

Cleary, S.F., Pasternack, B.S., Beebe, G.W. CATARACT INCIDENCE IN RADAR WORKERS. Arch. env. Health, Aug. 1965, 11(2), 179-182. (Environmental Medicine Institute, New York University, New York, N.Y.).

Occupational exposure to microwave radiation on the part of Army and Air Force personnel during World War II and the Korean War probably did not increase their risk of developing cataracts before 1963. The results of an analysis of cataract incidence among personnel of the US Army and US Air Force do not provide evidence to support the hypothesis of an increase in the relative risk of cataract induction as a result of military occupational microwave employment. The diagnostic indices of all hospitals in the Veterans Administration system were screened to select a sample of 2,946 white male Army and Air Force veterans born after 1910 who had been treated for cataracts in the interval 1950-1962, inclusive. A control sample of 2,164 Army and Air Force veterans was obtained from the same sources by selecting men with adjacent hospital register numbers. The control group was thus composed of men with random diagnoses, made in the same hospitals and at the same time as the cataract diagnoses, and limited to Army and Air Force veterans born after 1910. Adjustment of the relative risk for branch of military service and age had no significant effect on the results of the analysis.

R 7

26,955

Gillen, H.W. NEUROLOGIC HAZARDS OF DIVING. Arch. env. Health, Aug. 1965, 11(2), 215-220. (School of Medicine, State University of New York, Buffalo, N.Y.).

Deep sea diving, caisson or tunnel work, and sport diving have one common feature--the high barometric pressure of the environment of the individual. The high pressure introduces several potential hazards to the diver related to the gases of the high pressure environment or to the pressure changes encountered when entering or leaving the high pressure environment. Several dangers of diving produce clinical disasters involving the nervous system. These may be due to constituent gases of respiration, to contaminants of the same gases, or to pressure differences within body cavities and tissues. Some of the neurologic manifestations of decompression sickness--air embolism, inert gas narcosis, and oxygen toxicity--are described. A few of the marine life hazards that are toxic to the nervous system are mentioned. Careful diving technique combined with knowledge of the potential sources of danger should permit safe diving without embarrassment to the nervous system. Carelessness in diving is fraught with danger.

R 16

26,956

Burner, A.M., Thomas, R.G. & Benson, R.E. WHOLE BODY GAMMA SPECTROMETRY. Arch. env. Health, Sept. 1965, 11(3), 296-301. (USAF Radiological Health Lab., Wright-Patterson AFB, Ohio).

The need for whole-body counting facilities is suggested in the introduction to this paper. Studies conducted at the Atomic Energy Commission Health and Safety Division, National Reactor Test Site, on comparison of excretion analysis with whole-body counting have demonstrated that urinalysis is grossly inadequate as a general monitoring technique for the detection of internal contaminants. The various uses of whole-body counters is presented. The 2nd section of the report is entitled Facility Design and the following topics are discussed: Location, Shielding Material, Ventilation, Detectors, Analyzers, Anticlaustrophobic Measures, and USAF Facility. Section 3 is concerned with calibration techniques and section 4 discusses the quantitative determination of body burdens. In conclusion the following personnel are felt to be candidates for examination and evaluation in a whole-body counting facility: a) personnel that are monitored by neutron film badges - this group includes all Air Force personnel working at Air Force reactors, personnel working at the Nuclear Engineering Test Facility, and personnel working in such facilities as particle accelerators; b) personnel routinely exposed to the presence of fission products; c) personnel routinely exposed to radioisotopes in their laboratory duties; and d) personnel exposed to ionizing radiation hazards in space. (HEIAS)

R 3

26,957

Boysen, J.E. MEDICAL SUPPORT OF SPACE OPERATIONS. Arch. env. Health, Sept. 1965, 11(3), 311-315. (Cocoa Beach, Fla.).

A far reaching pilot program of occupational health was conceived and developed over the past few years. The new John F. Kennedy Space Center of NASA was chosen as a site for the pilot program; it was also determined that the medical support was to be provided by contract for all operations responsible to the Kennedy Space Center. The services available to employees are outlined in the paper. The functional elements of the organization consist of 3 separate sections: Occupational Medicine, Bioenvironmental Engineering and Medical Administration. The functions and essential staff positions of these sections are briefly given. In addition the many and unique problems of establishing and developing an effective occupational health program at MILA, America's first true space port are discussed in this report. Their nature stems largely from a changed concept of government contracting for non-personal services; it is compounded by the multitude of contractors and subcontractors involved; and stimulated by the importance of good medical support for this vital, national program of space exploration. The answers to some of these problems are discussed and the goals are briefly described. Time should provide a more definitive program which will benefit the quality and importance of the United States program of space exploration.

26,958

Thomas, A.A. LOW AMBIENT PRESSURE ENVIRONMENTS AND TOXICITY. Arch. env. Health, Sept. 1965, 11(3), 316-322. (USAF 6570th Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

This paper describes the structure and functions of a "Thomas Dome" exposure chamber which has the capability to simulate all environmental parameters that are peculiar to space cabin atmospheres. This unique inhalation exposure facility has been built to study the effects of low atmospheric pressure and oxygen-rich atmospheres on the characteristics of truly uninterrupted long-term exposure to toxic gases and vapors. A cooperative Air Force-National Aeronautics & Space Administration (NASA) research effort is currently exploring the following fundamental questions: a) does a 5 psi, single gas, oxygen atmosphere cause pulmonary irritation or functional impairment during a 90-day exposure; b) will a 2-week exposure, under similar circumstances, show any appreciable pulmonary change; c) will a pulmonary irritant (nitrogen dioxide), at graded doses, show a more pronouncedly irritating effect during a 2-week exposure to 5 psi oxygen environment than under ambient pressure and normal atmospheric composition; d) will a pulmonary irritant that also exhibits marked systemic effects (ozone) be more toxic under the above conditions; e) will a systemic poison (carbon tetrachloride) that has no pulmonary irritating effect at the concentration employed exhibit more pronounced enzymatic and histologic change due to low ambient pressure environments? Tentative conclusions and future research plans are briefly discussed.

26,959

Dines, J.H., Sutphen, J.H., Roberts, L.B. & Ashe, W.F. INTRAVASCULAR PRESSURE MEASUREMENTS DURING VIBRATION. Arch. env. Health, Sept. 1965, 11(3), 323-326. (Ohio State University Research Foundation, Columbus, Ohio).

In order to assess the physiological response of a system to vibration, it is generally necessary to make measurements during vibration; hence the sensing elements used have to operate, without gross artifact, in a vibrating field. Many instruments which are satisfactory for normal use are either electrically noisy when used on vibrating Ss, or are themselves sensitive to vibration. The purpose of this paper is to describe, firstly, the modifications made to an existing blood pressure catheter transducer so that it could be used to make measurements during vibration. Secondly, some cardiovascular measurements made, using the modified transducer, on anesthetized dogs while they were being subjected to various vibrational intensities, are reported. The results mainly consist of measurements of early transient changes in heart rate and blood pressure. No long term effects were studied in these purely exploratory experiments. In general, the response pattern in the 1st 40 sec. of vibration showed an increase in heart rate and a dip in blood pressure. (HEIAS)

26,960

von Gierke, H.E. ON NOISE AND VIBRATION EXPOSURE CRITERIA. Arch. env. Health, Sept. 1965, 11(3), 327-339. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Laboratory and clinical studies of reversible and possible irreversible nonauditory effects of noise, particularly autonomic vascular reactions, deserve further attention with respect to their possible significance. Criteria for evaluating the interference of noise with job performance and for judging annoyance are available but not uniformly accepted. Work on the acceptability of infrasonic noise and of the sonic boom from supersonic flight is in progress. Criteria for ultrasound exposures would be desirable but data are limited. No generally accepted criteria for rating vibration exposure are available. All proposed rating schemes are based on subjective judgment of tolerability or comfort and not on objective indications of various levels of risk of physiological damage. In view of the strong general desire to agree on a uniform procedure for rating vibration, exposure criteria for general use are being developed; however, there is no choice but to base them on a compromise between the various subjective rating schemes proposed. Inclusion of the time dependence of the acceptability of vibration levels in line with some of the data discussed appears very desirable. Quantitative criteria for hand tool vibrations cannot yet be stated.

R 44

26,961

Sulzberger, Marion B. THE EFFECTS OF HEAT AND HUMIDITY ON THE HUMAN SKIN. Arch. env. Health, Oct. 1965, 11(4), 400-406. (USA Letterman General Hospital, San Francisco, Calif.).

The fact of high military incidence of skin diseases and possible explanations of this high incidence is discussed in the introduction to this paper. It is specifically noted that while the whole surface of the skin is in contact with the air and its contents, it is only the first outer fraction of a mm that is being exposed to a significant degree. A description of the physical and chemical characteristics of this outermost "layer" follows. The protective functions of an intact ectomembrane are then enumerated. Effects of extremely dry environments upon the skin are discussed and various skin diseases are classified according to their association with the "too wet" or "too dry" end of the continuum. The author then discusses 4 problem areas which are presently being investigated: a systematic study of blistering beginning with a precise quantification of the vesicant traumas of friction, suction, heat and chemicals is being conducted; the 2nd major object of study is miliaria. A 3rd area of major concern is the investigation of some tentative findings which indicate that sweat may act as an attraction, and ether-soluble materials from the skin surface as a repellent for *Aedes aegypti*. A 4th area is concerned with factors that alter the permeability of the human skin. (HEIAS)

R 9

26,962

Collins, K.J., Crockford, G.W. & Weiner, J.S. SWEAT-GLAND TRAINING BY DRUGS AND THERMAL STRESS. Arch. env. Health, Oct. 1965, 11(4), 407-422. (Environmental Physiology Research Unit, MRC, London School of Hygiene & Tropical Medicine, London, England).

Adaptive changes take place in the human sweating mechanism as the result of repeated episodes of thermal stimulation. A given thermal strain then produces an augmented response and the enhanced sweating capacity serves to improve heat regulation during the acclimatization process. When body temperature is repeatedly elevated, only minimal changes occur in sweating capacity if at the same time sweat-gland activity is inhibited by indirect cooling. These observations support the concept of a peripheral training phenomenon, but the possibility that concurrent changes occur in central nervous excitability cannot be entirely discounted in view of the reported earlier initial response of the sweat glands in the acclimatized state. However, the lack of any change in sensitivity to neurohumoral agents at the periphery suggests that neural changes, if they occur, are more likely to be associated with central responsiveness. Glandular training may also be artificially induced by repeated direct chemical stimulation, and the characteristics of the enhanced responses are generally consistent with the events in heat acclimatization. These facts have been utilized to demonstrate that the focal response to a standard injection of sudorific drug can be used to monitor changes in sweat output in groups of persons undergoing heat acclimatization. There is no evidence that the number of active glands multiple.

R 37

26,963

Rosenthal, S.R. PHARMACOLOGICALLY ACTIVE AND LETHAL SUBSTANCES FROM SKIN. Arch. env. Health, Oct. 1965, 11(4), 465-476. (Preventive Medicine Dept., University of Illinois College of Medicine, Chicago, Ill.).

Pharmacologically active substances are released from the thermally injured skin of human and animal Ss. Among others there are histamine, bradykinin, adenylic compounds, and possible serotonin that can be recorded. The amount of pharmacologically active substances released is directly related to the degree of injury. Following burning of the skin, degradation products are released that are toxic and lethal to the host. This toxin or toxins are to be differentiated from the pharmacologically active substances described above. It is postulated that a true burn toxin or toxins exist. The release of histamine from the skin of animals and man begins at threshold stimuli and the amount released is directly related to the stimulus. It is postulated that histamine is the chemical mediator for cutaneous pain.

R 19

26,964

Taplin, D., Zaias, N. & Rebell, G. ENVIRONMENTAL INFLUENCES ON THE MICROBIOLOGY OF THE SKIN. Arch. env. Health, Oct. 1965, 11(4), 546-550. (Dermatology Dept., University of Miami, Fla.).

The effects of a tropical jungle environment on the microbial flora of the skin was studied in a group of military personnel. Men with preexisting microbial skin disorders became worse in the jungle. There was a high incidence of tinea pedis and erythrasma of the feet in this group before entering the tropics and this incidence remained unchanged. Tinea corporis, candidiasis, and staphylococcal infections increased in the jungle. The clinical appearance and incidence of *P. aeruginosa* infections in the toe webs is reported. The importance of correct diagnosis to prevent dermatological casualties in the tropics is stressed.

R 9

26,965

Klaus, D.J. & Glaser, R. INCREASING TEAM PROFICIENCY THROUGH TRAINING. 5. TEAM LEARNING AS A FUNCTION OF MEMBER LEARNING CHARACTERISTICS AND PRACTICE CONDITIONS. Contract Nonr 2551(00), Proj. NR154 079, AIR E1 4/65 TR, May 1965, 52pp. USN Office of Naval Research, Washington, D.C. (American Institutes for Research, Pittsburgh, Penn.). (AD 471469)

This study investigated the effects of variations in team member characteristics and team practice conditions on the rate at which a team response is acquired and extinguished. The variables investigated included: a) the average response proficiency attained by individual team members at the time the team was formed; b) the rate at which this level of member proficiency was attained during individual practice; c) the degree of homogeneity in proficiency among the members comprising a given team; and d) the extent of delay between the completion of individual learning and the initiation of team training. Each of the 28 teams studied was organized in a modified series arrangement so that all 3 members had to be correct for a team reinforcement to occur. Of the variables studied, only the proficiency level of the members at the initiation of team training was a determinant of the rate of team acquisition or team extinction. Supplemental analyses, however, revealed several differences in the course of learning, aside from rate, which were attributable to the other variables.

R 4

26,966

Carson, S., Goldhamer, R., Mackars, A. & Silson, J.E. EFFECTS OF CIGARETTE SMOKE ON RESPIRATORY FUNCTION. Arch. env. Health, Nov. 1965, 11(5), 635-640. (Food & Drug Research Laboratories, Inc., Maspeth, N.Y.).

Results are presented of studies involving the Mead-Amdur total body plethysmograph procedure for recording changes in respiratory function of guinea pigs exposed to cigarette smoke. Comparison was made of 9 filter cigarettes, 7 of which were commercial and 2 experimental. The data reveal that it is possible to differentiate quantitatively between samples, and that the effects are manifested by a primary increase in pulmonary resistance which contributes to a drop in the respiratory rate. Differences between cigarettes may be attributed to differences in both filter construction and tobacco composition. Activated carbon in the filter appears to reduce the effects on respiratory dynamics.

R 4

26,967

Cockett, A.T.K., Nakamura, R.M. & Kado, R.T. PHYSIOLOGICAL FACTORS IN DECOMPRESSION SICKNESS. Arch. env. Health, Dec. 1965, 11(6), 760-764. (Harbor General Hospital, Torrance, Calif.).

The pathophysiology of decompression sickness with manifestations of circulatory collapse (shock) is discussed in the first part of the report. The authors point out that decompression sickness is not fully understood. 2 experiments are described which were designed to test the efficacy of 2 therapeutic modalities after subjecting mongrel dogs to lethal overcompression-decompression. The 2 modalities are plasma replacement by dextran and moderate total body hypothermia for 6 hrs. 37 animals underwent decompression. 18 animals were listed in the control group and all died within 6 hrs. The experimentation period extended over 12 months. 8 dogs were treated with intravenous dextran following decompression. All 8 dogs survived. 5 of 6 dogs undergoing hypothermia for 6 hrs. followed by dextran survived. Pathological changes of a general nature were found in all animals not surviving. The authors conclude that recompression is still the treatment of choice in the management of acute decompression sickness. However, they believe that the infusion of dextran or a plasma expander is also indicated at the time of recompression. (HEIAS)

R 14

26,968

Klaus, D.J., Grant, L.D. & Glaser, R. INCREASING TEAM PROFICIENCY THROUGH TRAINING. 6. SUPERVISORY FURNISHED REINFORCEMENT IN TEAM TRAINING. Contract Nonr 2551(00), Proj. NR154 079, AIR E1 5/65 TR, May 1965, 58pp. USN Office of Naval Research, Washington, D.C. (American Institutes for Research, Pittsburgh, Penn.). (AD 471470)

As a consequence of the reduced ratio of reinforcement in going from individual to subsequent team training, initial levels of team proficiency are far lower than predicted on the basis of the proficiencies of individual members. To overcome this decrement, experimental teams were provided with both individual and team reinforcement during the initial stages of team training, paralleling the procedure used by many supervisors in team training situations. Results were obtained from 24 laboratory teams at varying levels of proficiency and trained to 2 levels of criterion performance. The combined use of team and individual reinforcement produced team proficiency more rapidly than when team training was given without individual reinforcement, but the facilitating effect of individual reinforcement was lost when this added feedback no longer was provided. The experimental teams required almost as many trials to achieve the team proficiency criterion under team reinforcement alone after having once achieved it with combined team and individual reinforcement as did the control teams. The main conclusion is that the use of supervisory-furnished individual reinforcement on a regular basis during team training is satisfactory only if also provided later in the performance situation.

R 8

26,969

Purcell, G. BLOOD CLOTTING STUDIES IN A SUBMARINE CREW. SERIAL ANALYSIS OF THE CLOTTING MECHANISM DURING PROLONGER SUBMERGENCE. Arch. env. Health, Dec. 1965, 11(6), 804-806. (USS Theodore Roosevelt, Medical Dept.).

A battery of 5 tests has been employed to analyze the several phases of the blood clotting mechanism in 10 normal volunteer Ss in serial fashion throughout a Polaris Submarine patrol cycle. Results of all tests remained well within accepted normal limits throughout the prepatrol segments of the testing period. Etiologies of acquired coagulation defects are discussed briefly; precautions to avoid such developments are presented, and reparative measures in the iatrogenically induced coagulopathies are outlined. Proposal is made that a simple platelet screening test, the prothrombin time, and the partial thromboplastin time provide a means of anticipating the development of hemorrhagic diathesis postoperatively, should surgery aboard the nuclear submarine become a necessity.

R 16

26,970

Baier, E.J. STANDARDS FOR EXPOSURE TO AIRBORNE CONTAMINANTS. Arch. env. Health, Dec. 1965, 11(6), 846-849. (Pennsylvania Health Dept., Harrisburg, Penn.).

The primary objective of standards for controlling air contamination in industry is to reduce the day to day exposure of people who work. An attempt has long been made by the US Public Health Service to have more uniform standards adopted. This report enumerates and briefly discusses the work of several agencies in establishing standards. The paper is organized under the following headings: a) Threshold Limit Values: a threshold limit value, or TLV, is defined as the concentration of an airborne contaminant to which workers may be exposed repeatedly, day after day, without adverse effect. A list of limits for over 300 substances is available including documentation which defines what the limit protects against; b) "Ceiling" Values: a ceiling value is defined as an exposure limit which should never be exceeded. All exposure levels to the particular substance should fluctuate below the ceiling value; c) Short-term Limits: a short-term limit is defined as the maximum atmospheric concentration to which a workman may be exposed for a specified short period. The concentration represents the upper limit of exposure for the specified time and assumes that there are sufficient recovery periods between episodes for recuperation; d) Hygienic Guides: various hygienic guides are discussed; e) ASA Acceptable Standards (American Standards Association); f) Emergency Exposure Limits; g) Application of Standards. (HEIAS)

R 2

26,971

Dorfman, D.D. & Miller, R. SOME EFFECTS OF LIGHT ON SOUND INTENSITY GENERALIZATION. Psychonomic Science, Nov. 1965, 3(10), 437-438. (San Diego State College, San Diego, Calif.).

This study determined whether a sound intensity generalization gradient would be displaced laterally if extraneous light intensities were changed from training to test. The results showed that: a) when Ss were trained in the absence of a light, introduction of the light on generalization-test trials displaced the generalization gradient toward the weaker sound intensities; and b) when Ss were trained in the presence of a light, omission of the light on generalization-test trials displaced the gradient toward the larger sound intensities.

R 3

26,972

Moore, J.W. & Halpern, J. TWO CHOICE DISCRIMINATION LEARNING AS A FUNCTION OF STIMULUS SIMILARITY ALONG AN AUDITORY INTENSITY DIMENSION. Psychonomic Science, Nov. 1965, 3(10), 441-442. (University of Massachusetts, Amherst, Mass.).

120 Ss received 300 trials in a simple auditory discrimination learning situation. Each of 2 pure tones was associated with 1 of the alternative choice responses, and the combinations  $S_1-A_1$  and  $S_2-A_2$  were reinforced 100% with events  $E_1$  &  $E_2$ , respectively. The 2 tones differed only in their intensity, and  $\Delta I$  was varied between 0 & 6 db. Proportion correct responses was a linear increasing function of  $\Delta I$ , and there was no stimulus intensity dynamic effect on response probability.

R 2

26,973

Teghtsoonian, Martha & Teghtsoonian, R. SEEN AND FELT LENGTH. Psychonomic Science, Nov. 1965, 3(10), 465-466. (Smith College, Northampton, Mass.).

Apparent length of rods was scaled by a method of magnitude estimation. Os judged the rods on 2 occasions, once presented visually and again kinesthetically. Length seen and length felt are both related to physical length by a power function with an exponent of unity.

R 9

26,974

Baird, J.C. & Vernon, C.W. BINARY ESTIMATION. Psychonomic Science, Nov. 1965, 3(10), 469-470. (USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C. & Princeton University, Princeton, N.J.).

A new psychophysical method was applied in 2 experiments in which Ss used binary decisions to estimate directly the position of a stimulus with respect to a specified physical scale. Linear functions were obtained for visual judgments of stimulus location and luminance.

R 8

26,975

Soref, R.A. & McMahon, D.H. BRIGHT HOPES FOR DISPLAY SYSTEMS: FLAT PANEL AND LIGHT DEFLECTORS. Electronics, Nov. 1965, 38(24), 56-62. (Sperry Rand Research Center, Sudbury, Mass.).

This article discusses recent developments in the area of display systems: new materials, new light sources, and new ways to manipulate light with electric and magnetic fields. The 4 means of deflecting light beams are indicated: mechanical, electromechanical, electroacoustic, and electro-optic. Electro-optic devices, the most promising, are capable of high deflection rates, high resolution, and large deflection angles. In this class of deflectors, there are analog and digital type deflectors; the former continuously positions the light beam and in the latter the beam is positioned at any one of many discrete positions. The maximum rate at which data may be displayed in digital systems is governed by the properties of the electro-optic materials used (a tabular presentation of such materials and their parameters is included). The advantages and disadvantages of digital displays are considered relative to ordinary optical systems. Panel displays are likewise discussed. Finally a hybrid type display combining many of the advantages of both systems is considered. (HEIAS)  
R 11

26,976

Riley, W.B. TIME SHARING: ONE MACHINE SERVING MANY MASTERS. Electronics, Nov. 1965, 38(24), 72-78.

Time-sharing, the technique whereby programs are handled "in parallel," permits a dialogue between the computer and the user from a distance. The dialogue occurs whenever necessary, e.g. mistakes, inadequate procedures, without waiting until the computer completes previous programs (this is a disadvantage of batch processing--the execution of programs "in series"). A time-shared computer requires hardware for special tasks such as program relocation and memory protection. Also a priority system is necessary for programs not completed during the allotted time--some schemes such as round-robin and spare time--are described. The supervisory or monitoring programs supervise data recovery, input and output mechanics, charge accounting, language choice, and other routine and recurring tasks. Some commercial and scientific applications of time-shared computers are described. (HEIAS)

26,977

Miller, W.A. DATA DOTS IDENTIFY AERIAL PHOTOS. Electronics, Sept. 1965, 38(19), 106-109. (Fairchild Hiller Corporation, Bay Shore, N.Y.).

This article briefly describes the auxiliary data annotation set (ADAS), an electronic marking system which permits fast interpretation of reconnaissance and surveillance photographs. The system marks the film with time, latitude, longitude, speed, barometric and radar altitude, heading, pitch, drift, roll, date, sortie number, detachment, radar mode, correlation counter, sensor or station identification, and photographing unit. It is a flexible system which can be used to mark the film-records of side-looking radars, infrared scanners, and any other film producing system. The main components and their functions are indicated and the data format is illustrated.

26,978

Vodovnik, L. & McLeod, W.D. ELECTRONIC DETOURS OF BROKEN NERVE PATHS. Electronics, Sept. 1965, 38(19), 110-116. (Case Institute of Technology, Cleveland, Ohio).

This article describes an electronic system being developed to use one muscle to activate another whose neural link with the brain is broken. Thus far it has been limited to restoring motion in an arm. 6 movements have been programmed--5 which involve the shoulder, elbow, and wrist receive their motive power from an external source and the sixth grasping objects, is accomplished by electrical stimulation of a muscle with command signals originating at another muscle. Contrary to mechanical devices, the case system provides an alternate route to the denervated muscle via the trapezius, external electrodes, and an electronic stimulator. Details of the system and its functioning are described together with new techniques and modifications now being considered.  
R 7

26,979

Preswick, G., Reivich, M. & Hill, I.D. THE EEG EFFECTS OF COMBINED HYPERVENTILATION AND HYPOXIA IN NORMAL SUBJECTS. EEG clin. Neurophysiol., Jan. 1965, 18(1), 56-64. (Applied Electrophysiology Dept., National Hospital for Nervous Diseases, London, England).

The EEG effects of controlled hyperventilation, of hypoxia and of their sequential combination have been studied in 87 healthy adult Ss. 3 provocative techniques were studied: a) overbreathing alone; b) hypoxia alone (induced by a mixture of 5% oxygen and 95% nitrogen); and c) combined technique, in which the Ss were rendered hypoxic after overbreathing had been completed. By using the appearance of frontal delta rhythm as the end-point it was possible to compare the relative effectiveness of these procedures at various ages. Only the combined technique proved to be consistently reliable but all showed a decrease in effectiveness with advancing age. As a result of continuously measuring the changes in oxygen saturation and end-tidal CO<sub>2</sub> concentration during these manoeuvres, it has proved possible to estimate a quantitative threshold for a healthy adult population which will serve as a standard for comparison in subsequent studies in pathological states. A number of the factors thought to influence the threshold of appearance of frontal delta rhythm are discussed.  
R 29

26,980

Weitzman, E.D. & Kremen, H. AUDITORY EVOKED RESPONSES DURING DIFFERENT STAGES OF SLEEP IN MAN. EEG clin. Neurophysiol., Jan. 1965, 18(1), 65-70. (Neurology & Psychiatry Depts., Albert Einstein College of Medicine, Bronx, N.Y.).

Responses to auditory stimuli can be recorded from the scalp of man in all stages of sleep. Evoked responses to an auditory click of 50 to 60 dB intensity above threshold obtained during the various stages of a night's sleep from scalp electrodes in 10 normal Ss, were algebraically summed by means of an on-line Mneutron Computer of average transients. Electrodes were placed on the scalp at the vertex and right occiput and at the lateral margins of both orbits. At the vertex, the mean peak latency of the first positive deflection (P<sub>1</sub>) occurs at 50 msec after stimulation; N<sub>1</sub>, at 100 msec; P<sub>2</sub>, at 175 msec; N<sub>2</sub>, at 325 msec; and P<sub>3</sub> at 800 msec. The amplitude and latency of the components of longer latency (N<sub>2</sub> & P<sub>3</sub>) increase during stages 2 through 4 sleep. The amplitude of the summed auditory evoked responses during the REM (rapid eye movement) stage is considerably smaller than in the other stages and generally is of similar configuration to that of the awake state. The results support the concept that the auditory evoked response during sleep represents summed K complexes.  
R 23



26,981

Niedermeyer, E. & Hincliffe, R. VERTIGO AND THE ELECTROENCEPHALOGRAM. EEG clin. Neurophysiol., Jan. 1965, 18(1), 78-81. (EEG Neurophysiology Div., State University of Iowa College of Medicine, Iowa City, Iowa).

The EEG of 70 consecutive patients with the complaint of vertigo was analyzed. The clinical diagnoses were made on the basis of an extensive clinical investigation. No tracing was taken during a severe attack of vertigo. The EEG investigation was based upon records obtained with an 8 or 16 channel apparatus, utilizing both bipolar and referential technique and the "10-20" electrode system. The records included, routinely, hyperventilation and photic stimulation whereas sleep was obtained in only 40 patients. It was found that the majority of EEG records (51 out of 70) were normal. No case of epileptic vertigo was discovered. It was concluded that the EEG should occasionally help to evaluate the presence of accompanying brain damage in patients with disordered function of the vestibular apparatus. On the other hand, normal EEG records do not preclude the possibility of cerebral or brain-stem involvement, especially in cases of vertebro-basilar artery insufficiency.

R 20

26,982

Eidelberg, E. & Cheshire, F.C. SPECTRUM ANALYZER FOR EEG. EEG clin. Neurophysiol., Jan. 1965, 18(1), 85-87. (Neurobiology Div., Barrow Neurological Institute, Phoenix, Ariz.).

A phase-sensitive filter system, capable of giving information as to the phase relationships between 2 channels of data has been available for some time for spectrometric work and is known as a "phase-sensitive detector" or "heterodyne detector" and as a "lock-in amplifier." This type of instrument has not been used for EEG analysis; this article reports its application to the EEG. A versatile system is described, employed primarily for off-line EEG power spectrum analysis, using a phase-sensitive detector as a tunable filter element. It has found extensive application also as an on-line swept-f spectrum analyzer and in the measurement of phase relationships between EEG channels.

R 10

26,983

Kreitman, N. & Shaw, J.C. EXPERIMENTAL ENHANCEMENT OF ALPHA ACTIVITY. EEG clin. Neurophysiol., Feb. 1965, 18(2), 147-155. (Clinical Psychiatry Research Unit, MRC, Graylingwell Hospital, Chichester, England).

A cross-over randomised latin-square design was used to test 8 normal Ss for their EEG responses to auditory, tactile and visual discrimination tasks, and to mental arithmetic. Enhanced alpha activity occurred in 24 out of 64 test occasions. There were significant differences between Ss' mean alpha responses; enhanced responses occurred at least once in 7 of the 8 Ss. There were also significant differences between tests, tactile testing being most often associated with enhanced responses and visual tests least often. No association was found between the type of resting EEG and alpha change scores on testing. Arousal, as defined by EMG criteria, was positively correlated with degree of blocking, but the association was too weak to account for the differences in alpha activity between individuals or between tests. 2 patterns of "adaption" during testing are described. During the period of stimulation (2 min.) blocking responses showed a gradual return towards the resting level, while enhancement responses showed a continuous rise. The role of visual activity, including imagery, is thought to be an unlikely explanation of our results. Alpha activity probably has more than a single determinant. Theories of alpha activities which fail to account for enhancement effects must be reformulated, and in this context the study of adaptation patterns to constant stimuli might prove rewarding.

R 27

26,984

Berlyne, D.E. & McDonnell, P. EFFECTS OF STIMULUS COMPLEXITY AND INCONGRUITY ON DURATION OF EEG DESYNCHRONIZATION. EEG clin. Neurophysiol., Feb. 1965, 18(2), 156-161. (Psychology Dept., University of Toronto, Toronto, Ontario, Canada).

Human Ss were exposed to a sequence of visual patterns, each shown twice consecutively. Exposures lasted 3 sec and were separated by intervals of 15 sec. The patterns belonged to 8 categories, representing various complexity and incongruity variables. More complex or incongruous patterns evoked, on the average, longer desynchronization than less complex or incongruous patterns (6.3 sec as compared with 5.8 sec). The difference was found to be statistically significant when the data for all 8 categories were examined together and when the data for 4 of the categories (representing Irregularity of Arrangement, Amount of Material, Incongruity and Random Redistribution) were examined separately. No significant difference appeared between first and second presentations of the same patterns or between Ss who were extrinsically motivated (told to attend carefully for the sake of a later recognition test) and not extrinsically motivated, and none of the interactions was significant. There was, however, a significant tendency for desynchronization to grow shorter as the session continued. The findings are discussed in relation to theoretical and experimental work on motivational aspects of exploratory behavior and related phenomena.

R 14

26,985

Ciganeck, L. & Zalcik, J. APPLICATION OF THE EXPONENTIAL TIME-BASE IN RECORDING OF EVOKED RESPONSES IN MAN. EEG clin. Neurophysiol., Feb. 1965, 18(2), 190-191. (Clinical Electrophysiology Dept., Slovak Academy of Sciences, Bratislava, Czechoslovakia).

A device, using the exponential time-base of the cathode ray oscilloscope, is described, which improves the legibility of the evoked responses recorded by means of Dawson's (1947) superimposition technique.

R 4

26,986

Simon, W. THE REAL-TIME SORTING OF NEURO-ELECTRIC ACTION POTENTIALS IN MULTIPLE UNIT STUDIES. EEG clin. Neurophysiol., Feb. 1965, 18(2), 192-195. (Research Lab., Electronics & Center Development Office, Massachusetts Institute of Technology, Cambridge, Mass.).

Description of a method by which action potentials recorded simultaneously can be sorted in a moderate size machine in real-time and on-line.

R 2

26,987

Norkus, F.J., Wray, R. & Mills, P.J. DIGITAL CONVERTER SYSTEM FOR ELECTROENCEPHALOGRAPHIC RECORDS MADE UP FROM LABORATORY INSTRUMENTS. EEG clin. Neurophysiol., Feb. 1965, 18(2), 196-197. (Parham Hearing Institute, Loyola University, Chicago, Ill.).

A method is described for the conversion of EEG records to digital form by the use of standard laboratory instruments and a photo-cell scanner. The converter scans the EEG trace, measures the height of the trace at 0.6 mm intervals and records the digital values as printed 3 digit numbers.

R 2

26,988

Haussmann, R.D. & Rath, G.J. AUTOMATIC TEACHER ASSIGNMENT--A GPSS SIMULATION. J. Educ. Data Processing, Summer 1965, 2(3), 103-108. (Northwestern University, Evanston, Ill.). (Re-print)

The simulation has provided the following information about the system's operation under the policies tested: a) With a normal "jobs available" load, the policies tested result in a system effectiveness ranging from 74% of the jobs filled with the second policy, when the number of refusals per day are limited to 2 per teacher, to 87% of the jobs filled with the fourth policy, a combination of policies 2 and 3. The third policy, division of the school area into seven sections, was 85% effective; and the first policy, no restrictions, was 86% effective. b) Under the same operating conditions, policy 3 required 1.60 calls to fill one position; policy 4, 1.64 calls; policy one, 1.70 calls; and policy 2, 1.71 calls. c) Policy 2 resulted in a lower mean number of calls per day per teacher than policy 3, but this was reversed with respect to the mean number of refusals per day per teacher. The fourth policy combined and heightened both effects. d) Policies 2 and 4 resulted in a mean number of calls per month of 7, while one and 3 yielded values of 14.5 for this variable. The simulation as a whole seems to have been quite successful, and further efforts in a similar direction have been indicated. The simulation does indicate the type of data which should be gathered for this analysis. The development of a system simulation of the board of education's information system would yield benefits. Among these benefits are a common analytical language and structure, data and criteria requirements, and a structure to test alternative proposals.

R 2

26,989

Gault, F.P. A SIMPLE DEVICE FOR CONTROLLING TRANSIENTS IN AUDITORY STIMULI. EEG clin. Neurophysiol., Feb. 1965, 18(3), 300-301. (Psychology Dept., Yale University, New Haven, Conn.).

The sudden application of a voltage to a speaker such as the control of an auditory signal by a relay or switch will produce a transient click. Such clicks are a source of annoyance to persons looking at auditory evoked potentials since a click tends to activate the cochlea over a wide range. Clicks of this type can also be a confusion to persons working with auditory discrimination behavior since each click will be similar despite the changes in the basic frequency being turned on and off. This report describes a simple inexpensive method by which click transients can be eliminated. The method consists of inserting a resistor type photocell in series with the output of an audiogenerator.

26,990

Querol, M. THE ELECTROENCEPHALOGRAM IN A GROUP OF NATIVE HIGHLANDERS AT 4540 METERS ALTITUDE AND AT SEA LEVEL. EEG clin. Neurophysiol., March 1965, 18(4), 401-408. (Laboratorio de EEG, Hospital Larco Herrera, Lima, Peru).

EEG tests were carried out in Morococha (4540 m above sea level) on 8 normal Ss who were born and were living above 3600 m altitude. In Magdalena (district of Lima at sea level) 5 of the Ss were examined during the 1st month and between the 2nd & 3rd month after their descent. A last EEG was recorded for 4 of the Ss between the 6th & 7th month after their arrival in Lima. Blood sugar determinations and the analysis of alveolar air were made for some of the Ss at or near the time of the EEG recordings. The recordings during rest at high altitude were within normal limits. When the group descended from Morococha to Lima, an increase was found in the voltage of the background activity with a statistically significant decrease in the mean frequency of the parieto-occipital rhythm (from 11 to 10.5 c/sec). Concomitantly there was an increase in voltage and in quantity of the slower waves. No statistically significant correlations have been found between the EEG frequency and the alveolar oxygen and carbon dioxide pressures and the pH values. The stability of the EEG of the highlanders in Morococha would indicate an acclimatization to high altitude. The EEG changes found upon descent could be considered as one indicator of the processes of acclimatization of the highlander to sea level conditions. The findings are discussed and possible interpretations are offered.

R 28

26,991

Adam, G., Preisich, P., Kukorelli, T. & Kelemen, Vera. CHANGES IN HUMAN CEREBRAL ELECTRICAL ACTIVITY IN RESPONSE TO MECHANICAL STIMULATION OF THE DUODENUM. EEG clin. Neurophysiol., March 1965, 18(4), 409-411. (Neurophysiological Lab., Medical University of Budapest, Budapest, Hungary).

In this study the effect of duodenal stimulation on cerebral activity in relation to awareness of stimulation was investigated. In the 1st part of the experiment 20 patients served as Ss. Prior to the experiment, the S swallowed a double-walled Miller-Abbot tube, with an inflatable rubber balloon at its end. When the alpha activity indicating the resting state of the CNS appeared the experimenter began duodenal stimulation, and the lowest pressure which inhibited alpha activity was determined. This threshold showed considerable inter-S variation, ranging from 30-100 mm Hg. The S was instructed to raise a finger whenever he felt any distention pressure. This response was considered an objective independent measure of subjective sensations. In every S the duodenal stimulation evoked acceleration of the resting alpha activity and desynchronization. In 69% of the trials the change in cerebral electrical activity was not associated with subjective sensations. In the 2nd part of the experiment 14 Ss swallowed a triple-walled tube with 2 rubber balloons at its end. The Ss were habituated to the inflation of 1 of the balloons. During this period of prolonged habituation the S began the distention of the lower balloon and watched the appearance of desynchronization as a sign of duodenal discrimination. In 8 Ss the higher brain centers discriminated the 2 duodenal areas situated 15 cm from each other. The theoretical implications of this study are discussed. (HEIAS)

R 5

26,992

Dustman, R.E. & Beck, E.C. PHASE OF ALPHA BRAIN WAVES, REACTION TIME AND VISUALLY EVOKED POTENTIALS. EEG clin. Neurophysiol., April 1965, 18(5), 433-440. (US Veterans Administration Hospital, Salt Lake City, Utah).

A reaction time study was conducted in which 20 Ss were asked to respond to single flashes of light by closing a response switch as quickly as possible. The flashes were presented during 6 different phase intervals of alpha waves to determine whether reaction times would be related to alpha phase, thus reflecting changes in cortical excitability. RTs were found to be reliable faster when the stimulus light was flashed during certain portions of the alpha wave, thus supporting the hypothesis of an excitability cycle being related to the alpha wave. Inked plots of the resulting averaged visually evoked potentials yielded a complex wave consisting of 8 distinct components in the first 300 msec. of the response. Only 2 of these components correlated positively and significantly with RT. The peak delay of the earliest and most highly correlated of the 2 components was used as a measure for the interval of time required for the volley initiated by the flash to have reached the cortex and the neural integration necessary for "perception" to have occurred. When the alpha phase during which the light was flashed was corrected by this amount (57 msec), fastest mean RTs were found to fall on a surface negative phase of the wave while the slowest fell on a positive phase.

R 21

26,993

Gross, M.M., Begleiter, H., Tobin, M. & Kissin, B. AUDITORY EVOKED RESPONSE COMPARISON DURING COUNTING CLICKS AND READING. EEG clin. Neurophysiol., April 1965, 18(5), 451-454. (Psychiatry Dept., State University of New York College of Medicine, Brooklyn, N.Y.).

The shift from a casual task directed away from auditory stimuli to a task requiring a low order of effort directed to the auditory stimuli produced significant changes in the 4 major amplitudes and the total duration of the auditory evoked response.

R 15

26,994

van der Tweel, L.H. & Verduyn Lunel, H.F.E. HUMAN VISUAL RESPONSES TO SINUSOIDALLY MODULATED LIGHT. EEG clin. Neurophysiol., May 1965, 18(6), 587-598. (Medical Physics Lab., University of Amsterdam, Amsterdam, The Netherlands).

Sinusoidally modulated light, even at low percentages of modulation, gives rise to occipital responses, sometimes large. They may reproduce rather well the input sine wave in shape and in amplitude, especially between 9 & 15c/sec. for diffuse large field illumination and above 35 c/sec. for strong illumination with small fields. The responses between 9 & 15 c/sec. may be partly described by assuming a linear filter action. Resonance phenomena are observed, in which different types of stimulation yield compatible results. Responses and spontaneous activity seem to be additive to a considerable degree, as are the responses to stimulation of each eye. In the 9-15 c/sec. frequency range, where the responses exhibit mainly the fundamental frequency, cancellation effects are found with out-of-phase stimulation of both eyes. That the large distortions found may be caused in early stages of the visual process, and are essential, is discussed. Responses have been recorded at many frequencies when the light was seen as fused by the Ss. Although subjective flicker threshold curves bear no clear relation to either the size or shape of the responses, it is hoped that the recordings of evoked responses with sinusoidally modulated light, combined with the techniques presented by Clynes et al. (1964), will be a valuable supplement to the current methods of investigation.

R 12

26,995

Cogswell, J.F. & Estavan, D.P. EXPLORATIONS IN COMPUTER-ASSISTED COUNSELING. Contract Grant 7 14 9120 217, Tech. Memo. 2582/000/00, Aug. 1965, 26pp. System Development Corporation, Santa Monica, Calif. (AD 620602)

Explicit models of a school counselor's cognitive behavior in the appraisal of student information and of his overt verbal responses in the educational planning interview were made with computer programs and computer-controlled equipment. The computer system was based on recordings of the counselor's verbalizations in 2 situations--as he thought aloud while analyzing the student cumulative records prior to interviews, and as he conversed with the student during the interview. The sample consisted of 20 9th-grade students. A program on the Philco 2000 computer, representing the preinterview appraisal, accepts inputs such as school grades, test scores, and biographical data; analyzes the data according to the inferred model of the counselor's decision-making rules; and prints out statements such as "Student's grades have gone down quite a bit. Ask about this in interview. Possibly there are personal problems," or "Low counseling priority; no problems apparent." The automated interview is conducted by a teletype under control of the Q-32 computer in a time-sharing mode. This automated interview program reviews student progress, collects comments from the student, reacts to student plans, and helps the student plan a schedule of high school courses. To assess the validity of the model, the automated systems were compared to the responses of the original human counselor with a new sample of 20 students from the same population. The study indicates the potential value of the automated procedure for both research and field application.

26,996

Ciganek, L. A COMPARATIVE STUDY OF VISUAL AND AUDITORY EEG RESPONSES IN MAN. EEG clin. Neurophysiol., May 1965, 18(6), 625-629. (Institute of Experimental Medicine, Slovak Academy of Sciences, Bratislava, Czechoslovakia).

The EEG responses (evoked potentials) to light flashes and clicks, recorded in the mid-line occipital region in the same group of 30 Ss, were studied. In some cases the visual and auditory responses in different Ss presented considerable differences, in other cases some resemblance. The average visual and auditory responses for the whole group present the same waves. The latency of the auditory response is 10 msec. shorter. In comparison with the visual response the amplitudes of the 1st 6 waves of the auditory response are smaller and of the 7th wave larger. The possible physiological significance of the described responses is discussed. The existence of 2 constituents of the responses is envisaged: a non-specific localized "association", and a non-specific diffuse response. A proposal of further work in the interpretation of the described responses is given.

R 28

26,997

Ertl, J.P. DETECTION OF EVOKED POTENTIALS BY ZERO CROSSING ANALYSIS. EEG clin. Neurophysiol., May 1965, 18(6), 630-631. (University of Ottawa, Ottawa, Ontario, Canada).

A technique is described for the detection and analysis of evoked potentials by an analysis of zero crossings in the EEG. The technique is low cost, flexible and amenable to statistical treatment.

R 2

26,998

Broughton, R.J., Poire, R. & Tassinari, C.A. THE ELECTRODERMOGRAM (TARCHANOFF EFFECT) DURING SLEEP. EEG clin. Neurophysiol., June 1965, 18(7), 691-708. (Centre St. Paul, Marseille, France).

The electrodermal response (Tarchanoff effect) was studied during sleep. Spontaneous EDRs were usually rare during wakefulness but, even if frequent, did not undergo striking changes during falling asleep. They increased in number with passage to stage IV. EDRs could be elicited by various stimuli in all stages, always with a 1-4 sec. latency. In stage II, III, & IV the threshold was lowered, whereas in stage I<sup>rem</sup> it was quite high. EDRs provoked in stage I<sup>rem</sup> were sometimes associated with EEG changes (e.g., blocking of "saw-toothed" waves or a burst of posterior alpha activity) but not with partial jerks or REMs. Topographically, the EDR in all phases was seen to diffuse from the head caudally down the body axis and peripherally along the limbs, where conduction occurred at approximately 1 m/sec. In further studies EDRs were noted with various episodic sleep phenomena. Prefrontal bilateral lobotomy, hemispherectomy, or congenital agenesis of the corpus callosum did not influence the evolution of the EDG. Congenital analgesia was associated with difficulty in provoking EDRs by painful stimuli. The apparent neurophysiological basis and certain psychological correlations are discussed.

R 41

26,999

Petsche, H., Gogolak, G. & van Zwieten, P.A. RHYTHMICITY OF SEPTAL CELL DISCHARGES AT VARIOUS LEVELS OF RETICULAR EXCITATION. EEG clin. Neurophysiol., July 1965, 19(1), 25-33. (Institute of Neurology & Pharmacology, University of Vienna, Vienna, Austria).

Investigations were carried out in order to elucidate the mechanisms which determine the initiation of the regular theta activity in the rabbit's hippocampus. Time relationships between theta rhythm and unit discharges within the dorsal part of the nucleus of the diagonal band were studied. The following main conclusions were drawn: a) every cell recorded in this region may fire in bursts, synchronous with theta rhythm. According to the liability of these cells to fire in bursts, 3 different kinds of firing behaviour could be found: (1) units discharging in clearcut bursts ("active burst cells"), (2) units discharging in rather irregular bursts with varying latencies to theta waves ("passive burst cells"); (3) units firing only occasionally in bursts ("facultative burst cells"). The kind of firing depends on the cellular excitability and the level of reticular excitation; b) between burst duration (y) and burst period (p), a linear relationship exists. The regression lines between y and p were shifted by reticular stimulation and by eserine; c) the latency of burst with respect to theta wave did not change on variation of reticular excitation by electrical stimulation or eserine; d) form, frequency and even amplitude of the theta waves are determined by the cellular activity of the dorsal part of the nucleus of the diagonal band. The chief role of this nucleus is the transformation of the steady stream of reticular pulses into a discontinuous rhythmic burst pattern.

R 18

27,000

Trehub, A. SPONTANEOUS SLOW MODULATION OF FLICKER-EVOKED RESPONSE IN HUMAN BRAIN. EEG clin. Neurophysiol., Aug. 1965, 19(2), 182-184. (US Veterans Administration Hospital, Northampton, Mass.).

Cyclical changes in excitability of the optic pathway of the rabbit have been demonstrated with a period of approximately 200-350 msec (Bishop 1933). A much slower cycle (10-12 sec) of variations of cortical response to repetitive stimulation of the lateral geniculate in the cat has also been shown (Chang 1952). The present report describes a systematic distribution of the spontaneous slow cycles of the specific frequency response to flickering light in the human visual system.

R 3

27,001

Rodin, E.A., Grisell, J.L., Gudobba, R.D. & Zachary, G. RELATIONSHIP OF EEG BACKGROUND RHYTHMS TO PHOTIC EVOKED RESPONSES. EEG clin. Neurophysiol., Sept. 1965, 19(3), 301-304. (Neurological Research Div., Michigan Epilepsy Center, Detroit, Mich.).

Photic evoked responses were obtained in 20 normal male and 20 normal female Ss. It was demonstrated that females tend to have larger amplitude evoked responses than males. Inter-correlations of aspects of the evoked response curve with results of the frequency analysis of the EEG background showed highly significant correlations between amplitude of the photic response and energy amount of the EEG. Individuals with large amplitude evoked response curves showed a greater abundance of activity in all frequency bands than those who had small amplitude evoked response curves. The complexity of the evoked response curve--as reflected in the total number of positive peaks--was found to be significantly correlated with the amount of fast activity in the basic EEG.

R 11

27,002

Hord, D.J., Johnson, L.C., Lubin, A. & Austin, M.T. RESOLUTION AND STABILITY IN THE AUTO-SPECTRA OF EEG. EEG clin. Neurophysiol., Sept. 1965, 19(3), 305-308. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif.).

The limits to which power spectral analysis can be used in EEG research are described in terms of resolution and stability. Often the full potential of a computer is not realized because the mathematical filters of the program are adjusted so that their resolving ability is similar to that of visual analysis. This results in the production of broad, uninformative frequency bands. Using a very fine resolution that is just within the limits of acceptable stability yields autospectrograms that distinguish stages of sleep.

R 5

27,003

Donchin, E. & Lindsley, D.B. VISUALLY EVOKED RESPONSE CORRELATES OF PERCEPTUAL MASKING AND ENHANCEMENT. EEG clin. Neurophysiol., Oct. 1965, 19(4), 325-335. (Brain Research Institute, University of California, Los Angeles, Calif.).

Average evoked cortical potentials to pairs of flash stimuli have been studied in 5 Ss under conditions which give rise to 3 perceptual effects. When the flashes are relatively far apart 2 distinct flashes are seen and there is no perceptual interaction. As the flashes are brought closer together there is a retroactive brightness enhancement of the first flash by the second. When the flashes are still closer together a stage is reached where only one flash is seen and the characteristics of the first flash which the S is required to report are masked. The parameters of the flash stimuli determine the critical point at which two-ness and brightness enhancement cease and where masking of the first flash by the second begins. These parameters are the luminance level, the ratio of the luminances of the 2 flashes, and their durations. For all interflash intervals in the brightness enhancement range the response to paired flashes was approximately a linear sum of the responses to the 2 flashes when presented alone. These results suggest that retroactive brightness enhancement represents an interaction between the neural representations of the 2 flashes, while the masking phenomenon is due to a displacement of the neural response to the TF (first test flash) by the response to the BF (second brighter flash) and that this interaction occurs prior to the stage at which the average evoked potential is elicited.

R 33

27,004

Towle, P.A. THE ELECTROENCEPHALOGRAPHIC HYPERVENTILATION RESPONSE IN MIGRAINE. EEG clin. Neurophysiol., Oct. 1965, 19(4), 390-393. (Yale University School of Medicine, New Haven, Conn.).

Utilizing coded EEG characteristics and clinical data in retrospective clinical analysis a statistically significant exaggeration in hyperventilation response was found in 43 functional headache cases compared to 58 controls. 6 clinical variables (age, sex, state of awareness, medications, history of fainting, history of minor head injury) and 10 EEG characteristics (fundamental f, f regulation, amount of persistence of fundamental f, amplitude, amplitude modulation, symmetry, activity less than 8 c/sec, activity over 12 c/sec, HV response, and interpretation as to normalcy or degree of abnormality) were graded and recorded on punch cards. 2 factors, personality and constitutional changes, acting by means of hypocapnia and other humoral vasopressors at a local vascular level in deep brain-stem areas, were suggested to have been involved in the production of these findings. The changes were more pronounced in the vascular than the non-vascular headache cases, within our ability to accurately separate them suggesting that these were specifically migraine mechanisms.

R 31

27,005

Van Buren, J.M. A STEREOTAXIC INSTRUMENT FOR MAN. EEG clin. Neurophysiol., Oct. 1965, 19(4), 398-403. (Surgical Neurology Branch, National Institutes of Health, Bethesda, Md.).

A human stereotaxic instrument has been in use since 1960 which embodies the following features: a) Localization is achieved by fractional pneumography by routine demonstration of both the anterior and posterior commissures without the use of radiopaque oils; b) permits use with standard X-ray equipment; c) permits full surgical draping; d) instrument may be aligned with the intracerebral axes; e) full 3 plan graduated movement; f) permits skull entry at any point (apart from the central area at the vertex which underlies the apparatus) without the use of phantom target points or recomputation; g) precise realignment for staged procedures. The article is organized under the following headings: a) Description of the instrument; b) X-ray technique; c) Stereotaxic localization; d) The operative procedure. A large number of photographs are included.

R 2

27,006

Jeffreys, D.A. & MacKay, D.M. APERIODIC STIMULUS PRESENTATION WITH A CLOSED-LOOP MAGNETIC TAPE AVERAGING SYSTEM. EEG clin. Neurophysiol., Oct. 1965, 19(4), 404-406. (Communication Dept., University of Keele, Keele, Staffordshire, England).

An inherent disadvantage of closed-loop averaging systems, in common with those using drums or electromechanical commutator switches, is that, if each loop revolution initiates a single stimulus and response, the stimuli are presented at regular intervals of time, depending on the length of the tape loop and its speed. Thus the S is able to anticipate the moment of application of each stimulus. To overcome this limitation a simple triggered circuit has been developed to produce near-randomly variable delays of the order of msec to sec. It requires only 1 valve, an ordinary post-office type relay and a transformer. A description is given of the use of the device to permit aperiodic presentation of stimuli with an evoked response averager using a closed loop of magnetic tape.

R 3

27,007

Satterfield, J.H. EVOKED CORTICAL RESPONSE ENHANCEMENT AND ATTENTION IN MAN. A STUDY OF RESPONSES TO AUDITORY AND SHOCK STIMULI. EEG clin. Neurophysiol., Nov. 1965, 19(5), 470-475. (Psychiatry Dept., Washington University School of Medicine, St. Louis, Mo.).

The purpose of this study was to determine whether: a) attending to a stimulus produces an enhancement of the response to that stimulus; b) if this is the case, is this enhancement produced at the receptor level or more centrally; c) enhancement of the response occurs across sense modalities. In 47 consecutive normal Ss the average evoked cortical response to both click and shock stimuli was measured when the S was attending to one while ignoring the other stimulus. The amplitude of the evoked response to both click and shock was enhanced when the S attended to the stimulus, whereas the response to which he was not attending tended to be suppressed. These changes were statistically significant at the  $P < 0.001$  level. In 5 Ss the peripheral nerve response and the cortical response to shock were simultaneously recorded. In no case could the enhancement of the average cortical response with attention be accounted for by similar augmentation of the average peripheral nerve response. The amplitude of the early evoked cortical response to shock did not change with changes in attention in 4 Ss. Attending produced decreased amplitudes of responses to click or to shock in 7 Ss.

R 13

27,008

Callaway, E., III & Buchsbaum, M. EFFECTS OF CARDIAC AND RESPIRATORY CYCLES ON AVERAGED VISUAL EVOKED RESPONSES. EEG clin. Neurophysiol., Nov. 1965, 19(5), 476-480. (Langley Porter Neuropsychiatric Institute, San Francisco, Calif.).

Cardiovascular and respiratory cycles are among the many variables capable of modifying the averaged sensory evoked responses of humans. This report investigates the magnitude of influences that these 2 spontaneous biological rhythms exercise on the visual evoked response. Pairs of averaged EEG responses evoked by visual stimuli given at inspiration correlated more highly than did pairs with one evoked by stimulating at inspiration and the other evoked by stimulating at expiration. A comparison of averaged responses evoked by stimulating at the EKG Q wave and at 250 msec after the Q wave similarly showed pairs of averaged evoked responses to be most similar when evoked by stimulating at the same phase of the cardiac cycle. These findings lead to the conclusion that both cardiac and respiratory cycles are capable of contributing to variability in averaged visual evoked responses.

R 13

27,009

Chandler, P.J. & Parsons, O.A. EEG ABNORMALITIES AND VISUAL FIELD DEFICITS IN FLICKER PERCEPTION. EEG clin. Neurophysiol., Nov. 1965, 19(5), 481-483. (Psychiatry Dept., University of Oklahoma Medical Center, Oklahoma City, Okla.).

The present report is concerned with the relationship between findings from the EEG, and the relatively new method of flicker perimetry: the EEG is regarded as the criterion with which the flicker perimetry technique is to be compared. The flicker perimetry technique consists of obtaining thresholds for flicker for binocular and monocular presentations and at 27 points in the field of each eye distributed along the 10°, 20° and 30° circles. The application of previously established indices from flicker perimetry examinations in 87 chronic brain-damaged patients with a mild degree of impairment shows a considerable degree of agreement with findings from EEG records of these patients. Agreement was noted in both the identification of brain disorder and also in the lateralization of abnormality. The highly significant differences between normal and abnormal EEG groups in flicker thresholds suggest that the flicker method is sensitive to those brain dysfunctions which are reflected in EEG abnormality.

R 6

27,010

Travis, R.P., Jr. & Clark, L.C., Jr. CHANGES IN EVOKED BRAIN OXYGEN DURING SENSORY STIMULATION AND CONDITIONING. EEG clin. Neurophysiol., Nov. 1965, 19(5), 484-491. (Psychiatry & Surgery Depts., University of Alabama Medical Center, Birmingham, Ala.).

Platinum electrodes chronically implanted in the thalamic, amygdaloid, tegmental and caudate areas of 3 cats were used to record the oxygen currents ( $aO_2$ ) in response to novel and repetitious sensory stimuli and during conditioning and extinction. The oxygen availability in these circulatory beds of the brain was consistently changed by mild sensory stimulation and dramatically changed by conditioning procedures. In general, brief novel sensory stimuli produced a sharp increase in  $aO_2$  followed by a decrease and a gradual recovery over a period of about 1 min, with the response varying somewhat in different parts of the brain. Stimuli of long duration cause a change in  $aO_2$  at both the beginning and end of the stimulus. When auditory signals terminating in an electric shock were used to condition the animal, an increase in  $aO_2$ , found to be highly reproducible, occurred immediately post-stimulus and coincident with the point of electric shock. In avoidance conditioned cats, the changes in  $aO_2$  associated with the avoidance response were similar to those recorded in the shock conditioned animals but they required a long time to extinguish. The results are discussed in terms of neurogenic, hormonal and metabolic phenomena in the brain cells and circulation.

R 24

27,011

Estrin, Thelma. ON-LINE ELECTROENCEPHALOGRAPHIC DIGITAL COMPUTING SYSTEM. EEG clin. Neurophysiol., Nov. 1965, 19(5), 524-526. (Brain Research Institute, University of California, Los Angeles, Calif.).

An on-line analog-digital conversion system in communication with a remote time-shared computer is described simultaneously with the recording of electrical activity in the usual manner these neuro-electric signals are digitized in the laboratory and transmitted to a time-shared medium sized computer. A computer generated display exhibiting the computed results of a typical experiment using the system is briefly discussed. The a-d system has a priority interrupt which is used to inform the computer when it wishes to be in communication with it. The interrupt signal is processed (within msec) and conditions are set up which allow the a-d converter to time-share the computer. When the computer selects the a-d system it initiates a multiplexer scan starting at channel 1. Once a scan is initiated each channel is digitized in turn. After the last channel has been digitized the computer communication channel disconnects and services other users until the next multiplexer scan. The teletypewriter allows programs to be altered and parameters to be entered.

R 1

27,012

Osselton, J.W. ACQUISITION OF EEG DATA BY BIPOLAR, UNIPOLAR AND AVERAGE REFERENCE METHODS: A THEORETICAL COMPARISON. EEG clin. Neurophysiol., Nov. 1965, 19(5), 527-528. (Psychological Medicine Dept., University of Newcastle-upon-Tyne, England).

When an EEG recording is to be taken in a conventional manner, the choice of method depends to a large extent on the nature of the electroencephalographic problem and on the personal preference of the investigator. However, when EEG data are to be stored in an electrical form for subsequent analysis, the bipolar method of derivation would appear to have some practical advantages over both the unipolar and average reference methods. For a given array of  $n$  electrodes and  $(n-1)$  channels of amplification, the same basic information can be obtained by the use of any of the methods discussed.

R 4

27,013

Spehlmann, R. THE AVERAGED ELECTRICAL RESPONSES TO DIFFUSE AND TO PATTERNED LIGHT IN THE HUMAN. EEG clin. Neurophysiol., Dec. 1965, 19(6), 560-569. (Mayo Clinic & Mayo Foundation, Rochester, Minn.).

A marked difference was obtained in the averaged electrical responses of normal Ss when patterned light was used for stimulation instead of diffuse light. This difference is manifested mainly by the presence of a surface-positive "late wave" (180-375 msec), the amplitude of which varies with the density of contrast borders between black and white lines of the stimulus pattern. The different effect of diffuse and patterned light was also manifested with paired and with repetitive stimuli. Since the "light response", the "cortical excitability cycle" and the "driving" vary with comparatively subtle changes of the input, these evoked phenomena cannot be considered to be only expressions of invariable cortical characteristics. Spontaneous or induced changes in attention or variations in light intensity affected both types of responses in the same sense and did not appear to account for the difference between them. Because the "late wave" depends on the peripheral input and because it is limited to the posterior head regions like the other components of light responses, it should be considered "specific" notwithstanding its long latency.

R 53

27,014

Berkhout, J. COMPARATIVE FREQUENCY DISTRIBUTIONS OF LARGE AND SMALL AMPLITUDE RHYTHMS OF THE HUMAN ELECTROENCEPHALOGRAM. EEG clin. Neurophysiol., Dec. 1965, 19(6), 598-600. (L.E.N.A., La Salpetriere, Paris, France).

A base line crossing interval tabulating procedure was used to assess the rhythmic activity of a group of single channel occipital bipolar recordings in 2 discontinuous amplitude ranges. 100 sec. of record from each of 70 Ss were analyzed. The Ss included 38 normal individuals and 32 with miscellaneous cerebral pathology. Slowing of the large amplitude distribution was noted in the Ss with cerebral pathology. This contrasted strongly with the more static behavior of the small amplitude activity of these Ss. Large amplitude activity at or below 8 c/sec. meeting the strict persistence and homogeneity requirements used was found only among the pathological group. The 2 amplitude ranges had distinctive frequency distributions and appeared to be independently generated. Activity levels of the 2 ranges were also independent at frequencies where the 2 distributions overlapped. It was concluded that it would be advisable to incorporate some form of amplitude threshold restrictions into routine frequency analysis.

R 8

27,015

Bruck, M.A. AVERAGE VOLTAGE AS A MEASURE OF PHASE SYNCHRONY IN THE EEG. EEG clin. Neurophysiol., Dec. 1965, 19(6), 601-605. (US Veterans Administration Hospital, Canandaigua, N.Y.).

An indirect and less time consuming method to estimate synchrony ratios in EEGs from voltage is described. The relationship between the voltages of referential and simultaneous bipolar leads is used to develop a regression equation which allows the calculation of the synchrony ratio. A nomogram is constructed to simplify the procedure. For determining average voltage, we used a relatively inexpensive planimeter, as previously described. Any other method to find the average voltage with sufficient accuracy would be suitable too.

R 8

27,016

Kaufman, L. SOME NEW STEREOSCOPIC PHENOMENA AND THEIR IMPLICATIONS FOR THE THEORY OF STEREOPSIS. Amer. J. Psychol., March 1965, 78(1), 1-20. (Sperry Rand Research Center, Sudbury, Mass.).

The demonstrations herein described suggest: that sensory fusion of disparate stimuli is an inadequate concept for the prediction of stereopsis, and that the concept of disparity requires a more careful definition. Disparity exists between 2 points when they occupy different visual directions; it is an adequate stimulus for stereopsis when there are other points with different disparities in the visual field; however it breaks down with relatively complex and different visual fields. In I the disparity is between one of the binocular images and the unocular, but the same disparity does not produce a depth-effect in III when the superposed binocular images are dissimilar. This suggests that the nature of the disparate objects must be included in the definition of the stimulus to depth. The concept of fusion also becomes untenable in light of III as it should occur across all binocular forms but does not. Depth only occurs for similar forms. The fusion concept also fails to predict the outcome of V where depth occurs without disparity except on the outer edge of the patterns which causes a correlated inner region to go into depth. Thus, the suggested definition of the stimulus to stereopsis--it will occur when correlated stimuli are out of phase with respect to some reference system; fusion is not necessary.

R 29

27,017

Irwin, R.J. BINAURAL SUMMATION OF THERMAL NOISES OF EQUAL AND UNEQUAL POWER IN EACH EAR. Amer. J. Psychol., March 1965, 78(1), 57-65. (University of Auckland, Auckland, New Zealand).

The relation between binaural and monaural loudness was studied by determining what binaural combinations of noises of equal and unequal power--measured in decibels above threshold--were judged equivalent in loudness to a comparative monaural stimulus. 4 Ss, men, made judgements of equality at each of 4 levels of the comparison noises--levels equivalent to binaural noises of 10-, 30-, 50-, and 70-db. SL. Contours of constant loudness, for each of the 4 levels of the comparison-stimulus, indicated that the advantage of binaural over monaural listening was greater at high levels than at low. The advantage was also greater, at any comparison-level, when the binaural noise had about the same power in each ear. At high levels with equal binaural stimuli, the total binaural power was about 1/3 of that of the equally loud monaural stimulus, and at low levels it was about 4/5. As the difference between the 2 components of the binaural stimulus was increased, the powers of equally loud binaural and monaural noises gradually converged. The superiority of binaural over monaural listening was interpreted to be similar in nature to the increment in loudness that is observed when the bandwidth of a monaural noise is increased beyond a critical value.

R 9

27,018

Dinnerstein, Dorothy. INTERMANUAL EFFECTS OF ANCHORS ON ZONES OF MAXIMAL SENSITIVITY IN WEIGHT-DISCRIMINATION. Amer. J. Psychol., March 1965, 78(1), 66-74. (Rutgers University, New Brunswick, N.J.).

Anchor-weights, which with the method of single stimuli are known to affect verbal ratings of a weight-series, are here with the method of constant stimuli shown to affect discriminability. Data from 4 Ss, who made 2000 successive comparisons each, show that light vs heavy anchors, hefted in the non-judging hand, cause contrasting shifts in discriminability within the variable series. This finding supports the view that a type of change in the stimulus-field which can cause shifts in the 'modulus of judgment' would be likely also to cause functionally similar shifts in 'sensory excitability.'

R 12

27,019

Zimny, G.H. EFFECT OF FLICKER-PERIODICITY UPON PERFORMANCE AND AROUSAL DURING A ROTARY-PURSUIT TASK. Amer. J. Psychol., March 1965, 78(1), 75-82. (Marquette University, Milwaukee, Wisc.).

Each of 24 Ss, college women, carried out a rotary-pursuit task for 5 min under either a periodic or an aperiodic flickering light while measures of performance and arousal were obtained from them. The flicker conditions had no differential effects upon either performance or arousal. Performance improved during the task. All measures of heart-rate and skin-resistance indicated that arousal was greatest during the initial minute of the task, then dropped to a lower level, but still above the base, and remained there for the duration of the task, i.e., the last 4 min. Differences between heart-rate and skin-resistance as indicants of arousal were also considered.

R 18

27,020

Bevan, W. & Turner, E.D. THE INFLUENCE OF LIGHTNESS UPON THE JUDGMENT OF SIZE. Amer. J. Psychol., March 1965, 78(1), 90-95. (Kansas State University, Manhattan, Kan.).

The traditional approach to the study of psychophysical relationships has been to isolate the stimulus-variable under consideration from all other stimulus-properties. The limitations of this procedure for an understanding of judgment under complex stimulus-conditions is readily apparent. An alternative approach is suggested in which psychophysical judgments are made when the variable to be judged stands in a prescribed relationship to one or more additional stimulus-variables. The special case of one incidental variable is experimentally examined. By obtaining judgments when the variable to be judged (criterion-variable) and the incidental variable are perfectly correlated, positively and negatively, as well as for the traditional condition under which the incidental variable is held constant, it is possible to construct a space that will provide for the prediction of judgments under all degrees of relationship between the 2 variables. The variable chosen for judgment was the size of square gray patches mounted on a white background. The incidental variable was lightness of patch, the series members varying from dark to light gray. The psychophysical method was that of Newhall. When the correlation between lightness and size was 1.00, size-estimates were enhanced; when the correlation was -1.00, the effect was one of diminution. Under the condition of positive correlation, the Newhall function was bowed upward, while under the condition of negative correlation, the opposite was the case. Judgments obtained for stimuli terminating series with an intermediate degree of positive or negative relationship showed good agreement with predicted values.

R 7

27,021

Singer, G. & Sheehan, P.W. THE EFFECT OF DEMAND CHARACTERISTICS ON THE FIGURAL AFTER-EFFECT WITH REAL AND IMAGED INDUCING FIGURES. Amer. J. Psychol., March 1965, 78(1), 96-101. (University of Sidney, Sidney, Australia).

The Ss (84 in number) were allocated in the order in which they reported to 1 of 6 conditions. 3 different sets of instructions varied their expectations about the effect of pre-stimulation on the perception of tilt. For each instruction group there were 2 conditions of stimulus-presentation: fixation-stimulus present and fixation-stimulus absent, but imaged. The aim of the experiment was to investigate the effect of variation in demand characteristics on the figural after-effect under the 2 conditions of stimulus-presentation. The measure used was the angular deviation of the pre-setting to the vertical from the post-setting to the vertical. Results showed a symmetry of means around the groups that were not instructed to expect an effect in a particular direction. Ss imaging the tilted line under this set of instructions showed no appreciable deviation from the vertical in their experimental settings, while Ss actually fixating the stimulus showed an appreciable experimental response. The interpretation placed on these findings was that, when Ss' expectations are experimentally varied in a comprehensive methodological scheme, imaging is found to be a separate and distinct function from perceiving.

R 4

27,022

Church, R.M. & Camp, D.S. CHANGE IN REACTION-TIME AS A FUNCTION OF KNOWLEDGE OF RESULTS. Amer. J. Psychol., March 1965, 78(1), 102-106. (Brown University, Providence, R.I.).

The purpose of this experiment was to study the permanence of the decrease in RT produced by knowledge of results. 40 Ss were given 1250 RT-trials in a period over 5 days. The results were: a) Ss with knowledge were faster than those without knowledge; b) Ss with a warning signal of fixed duration were faster than those with a warning signal of variable duration; and c) the RTs decreased as a function of practice. There was no evidence of any lasting effect of knowledge on subsequent performance. Knowledge of results seemed to be effective only during periods in which it was given.

R 7



27,023

Moore, Mary E., Linker, E. & Purcell, Marguerite. TASTE-SENSITIVITY AFTER EATING: A SIGNAL-DETECTION APPROACH. *Amer. J. Psychol.*, March 1965, 78(1), 107-111. (University of Pennsylvania, Philadelphia, Penn.).

A signal-detection design which makes the distinction between sensitivity and response-bias was used to study the effect of eating on the ability of Ss to taste a sucrose solution before and after a lunch and a no-lunch condition. Sensitivity was found to be higher in the afternoon as compared with the morning sessions, but there was no difference in the sensitivity when the lunch and no-lunch conditions were compared. There was, however, a significant bias on the part of the S to report tasting sugar less after eating. Results of previous studies using the method of limits may have been confounded by the effects of similar bias.

R 11

27,024

Nachmias, J. & Steinman, R.M. AN EXPERIMENTAL COMPARISON OF THE METHOD OF LIMITS AND THE DOUBLE STAIRCASE-METHOD. *Amer. J. Psychol.*, March 1965, 78(1), 112-115. (University of Pennsylvania, Philadelphia, Penn.).

This paper presents data from an experiment on the detection of a line-increment, designed to compare Cornsweet's double staircase-method and the traditional method of limits with regard to bias introduced by the starting point. 2 Ss participated. 4 different pairs of starting luminances of the line-increment were employed with both methods--2 high bias and 2 low bias. The reference level around which the starting points were centered was determined separately for each S. It was found that the starting point clearly affects the average end-point in the method of limits; analysis of variance revealed a  $p$  of 0.01. In the double staircase method the effect is more pronounced if only the end-points of the first 16 trials are considered; however there is not a significant effect of end point in the last 16 trials.

R 6

27,025

Epstein, W. NONRELATIONAL JUDGMENTS OF SIZE AND DISTANCE. *Amer. J. Psychol.*, March 1965, 78(1), 120-123. (University of Kansas, Lawrence, Kan.).

Nonvisual tactual measures of the perceived size and distance of coins were obtained. The purpose was to determine whether earlier results indicating a relationship between assumed size and perceived absolute distance were artifacts of the visual relationships introduced by the use of visual comparison-objects. The results of the present study were generally in agreement with those of the earlier study, leading to the conclusion that the assumed-size-perceived-distance relationship was not a methodological artifact.

R 7

27,026

Morant, R.B. & Harris, Judith R. TWO DIFFERENT AFTER-EFFECTS OF EXPOSURE TO VISUAL TILTS. *Amer. J. Psychol.*, June 1965, 78(2), 218-226. (Brandeis University, Waltham, Mass.).

Exp. I was designed to determine the empirical functions relating aftereffects on vertical and horizontal test-lines to tilt of the inspection-line. 7 Ss made adjustments of a line to apparent vertical or horizontal following a 1 minute inspection of the tilt-line. 11 and 23 angles of inclination in 5° steps were utilized in various sequences. Exp. II attempted to factor out the effect of the normalization-like process, thus leaving the effects of the satiation-like process. Accordingly, 5 Ss made adjustments of a line until it appeared parallel to an objectively vertical line following a 1 min. inspection of a tilt-line (9 angles in 15° steps). The results indicate that 2 factors produce tilt aftereffects: a localized process resembling Kohler and Wallach's "satiation," and a nonlocalized process resembling Gibson's "normalization." When the inspection- and test-lines are in the same part of the visual field, these factors summate algebraically. They add to each other when the inspection-line is tilted less than 45° from a vertical or horizontal test-line, and they act in opposition at greater tilts. If a comparison figure in a different part of the visual field is used, only the satiation-like process can be shown.

R 11

27,027

Ray, W.S. MILD STRESS AND PROBLEM-SOLVING. *Amer. J. Psychol.*, June 1965, 78(2), 227-234. (Bethany College, Bethany, W. Va.).

3 experiments are reported which test the assumption that stress interferes with problem-solving. One was a repetition of a previously reported experiment in which a personal condition interfered with problem solving as compared with an impersonal condition. The replication failed to find a difference between the conditions. In another experiment a set for speed inhibited problem solving, as did frustration in the third. It was suggested that, above a minimal level necessary to produce work at the problem, further increase of drive-level would produce increasing inhibition of problem-solving, the effect being greater with complex problems. These experiments contradict the first half of the inverted-bow-shaped relation between motivation and problem-solving which has been postulated by previous theorists.

R 27

27,028

Dinnerstein, Dorothy. PREVIOUS AND CONCURRENT VISUAL EXPERIENCE AS DETERMINANTS OF PHENOMENAL SHAPE. *Amer. J. Psychol.*, June 1965, 78(2), 235-242. (Rutgers University, New Brunswick, N.J.).

2 studies of phenomenal shape show that interaction between a spatial and a temporal structure can closely resemble interaction between 2 spatial structures. In the light of this resemblance, unique characteristics of temporal organizations invite examination. The main point to be made is that certain phenomena usually conceived of as effects of past experience on perception are subject to the same principles which govern perception itself.

R 6

27,029

Pollack, I. BACKGROUND REFLECTANCE AND THE CATEGORY-SCALING OF GRAY PAPER. *Amer. J. Psychol.*, June 1965, 78(2), 243-250. (Applied Psychological Research Unit, MRC, Cambridge, England).

This note considers some stimulus and procedural factors influencing the category scaling of gray papers. The primary aim was to examine the role of the background-reflectance against which the papers were viewed and study the interaction of this with other factors-- Is the entire categorical function for brightness merely shifted or is there a change in shape of the function under different reflectances of background? 3 conclusions appear to be warranted from the experiment: a) the effect of background-reflectance alters the shape of the category of brightness, rather than introducing a shift of the entire function of the category; b) The effect of background-reflectance upon the scale of brightness is maintained over large variations in the area of the test-patch, the viewing illumination, and the number of response categories; c) The effect of background-reflectance is obscured by rating-scale procedures which impose severe restrictions upon the category-responses, e.g. the methods and procedures of category-sorting and marker-scaling.

R 6

27,030

Brody, N. THE EFFECT OF COMMITMENT TO CORRECT AND INCORRECT DECISIONS ON CONFIDENCE IN A SEQUENTIAL DECISION-TASK. *Amer. J. Psychol.*, June 1965, 78(2), 251-256. (Princeton University, Princeton, N.J.).

The present experiment explored the effects of initial commitment to correct and incorrect decisions on confidence in a task involving sequential decisions. 72 high school boys were randomly assigned to one of 3 experimental groups: Group D-, the members of which made an initial decision which was invariably incorrect; Group D+, which made an initial decision that was invariably correct, and Group ND which did not make an initial decision. The results support the following conclusions: a) Initial commitment to a decision tends to increase initial confidence; b) Initial commitment to an incorrect decision tends to decrease the rate of increase in confidence; c) Initial commitment to an incorrect decision leads to lower confidence in the final decision than initial commitment to a correct decision; d) Initial commitment to correct or incorrect decisions does not effect the timing of a final decision.

R 4

27,031

Natsoulas, T. A STUDY OF THE VERBAL-TRANSFORMATION EFFECT. *Amer. J. Psychol.*, June 1965, 78(2), 257-263. (University of Wisconsin, Madison, Wisc.).

This Exp. compares meaningful and meaningless bisyllables and introduces a trial-by-trial procedure permitting observations to be made of the effect of an interval during which repetitions cease. 32 men and 32 women served as Ss. Each of 9 bisyllables--4 English words, 4 nonsense words, and 1 practice word--were repeated at the rate of 65 per min. (The identical utterance effect was produced by repeated recording). All stimulus materials were presented binaurally. S signalled whenever there was an apparent change in the repeated utterance. Analyses of variance were performed for satiation-period (number of repetitions before first transformation), total number of forms heard for each bisyllable, and number of transformations. The sound pattern, its position in the total series, its interaction with the list exposed, and the thirds of the trial regardless of sound pattern were significant.

R 7

27,032

Keston, R. TEMPORAL CHROMATIC INDUCTION: THE INTERACTION OF TWO SUCCESSIVE PULSES MEASURED BY SUBJECTIVE ESTIMATES. *Amer. J. Psychol.*, June 1965, 78(2), 264-270. (New York State Psychiatric Institute, New York, N.Y.).

In Exp. I, the interaction of 2 successive flashes of equal luminance and duration was studied as a function of pulse-duration and luminance of the paired flashes. The first flash alone was yellowish-red in appearance and the second near-white. The results indicated that as the paired pulse-durations lengthen, reds become increasingly desaturated, then white, and finally blue-green. These results were shown to be consistent with Hurvich and Jameson's finding that, in spatial interactions affecting perceived color, induced responses are both opponent to and proportional to the magnitude of the inducing stimulus. In Exp. II, the effect of introducing a dark interval between the flashes was investigated. It was found that variation of the dark interval could produce a transition in perceived color similar to that brought about by variation of pulse-duration in Exp. I. In addition, the interaction between dark interval and pulse-duration was specified.

R 9

27,033

Woodruff, B. & Helson, H. TORQUE: A NEW DIMENSION IN TACTILE-KINESTHETIC SENSITIVITY. *Amer. J. Psychol.*, June 1965, 78(2), 271-277. (Kansas State University, Manhattan, Kan.).

The 2 experiments reported here show that sensitivity to torque measured by 2 different psychophysical methods behaves in a manner similar to sensitivity to tactile pressure. Torque involves not only psychological pressure but also resistance to movement, hence a greater kinesthetic component than is usually found in lifted-weight stimulation per se. Negatively accelerated curves for low values of the Std and positively accelerated curves found for high values of Std in lifted-weight data by Guilford were also found here when sensitivity to torque was measured by the comparative-rating scale. The Weber fraction for heavier judgments is close to that reported for weight-judgments, but that for lighter judgments was found to be considerably larger, perhaps because only data for one time-order of Std and Co were used in obtaining the Urban upper and lower thresholds. The values of both AL and PSE indicated that negative TOE is operative in judgments of torque as well as in lifted-weight judgments obtained by traditional methods. In conclusion, it should be pointed out that there was some arm- as well as finger- and wrist-movement in the experiments reported here and that quite different measures of sensitivity to torque may be obtained if only finger- and wrist-movement is involved, as is true when small knobs and dials are turned.

R 7

27,034

Root, R.T. & Ross, S. FURTHER VALIDATION OF SUBJECTIVE SCALES FOR LOUDNESS AND BRIGHTNESS BY MEANS OF CROSS-MODALITY MATCHING. *Amer. J. Psychol.*, June 1965, 78(2), 285-289. (USA Personnel Research Office, OCRD, Washington, D.C. & American Psychological Association, Washington, D.C.).

This study was designed to examine the equal-sensation function for loudness and brightness to ascertain whether the slope of this function could be predicted on a knowledge of the 2 exponents. 10 Ss matched the apparent intensity of auditory stimuli with visual stimuli under their control. There were auditory stimuli consisting of white noise in the range 54-90 db., each of which was presented 4 times in random order. Brightness settings were converted to db. and these were plotted against loudness-levels; best fitting line was then determined by the least squares method. The slope was found to be 0.908 compared to the expected one of 0.909, based on the ratio of the 2 exponents for these functions.

R 10

27,035

Deik, J.L. & Fillenbaum, S. DIFFERENCES IN PERCEIVED COLOR AS A FUNCTION OF CHARACTERISTIC COLOR. *Amer. J. Psychol.*, June 1965, 78(2), 290-293. (University of North Carolina, Chapel Hill, N.C.).

This experiment had 2 purposes: a) to investigate the possible effect of characteristic color upon perceived color; and b) to assess the possible biasing effects of instructions on color-matching judgments. Although differences in instruction had no effect upon judgments, there was highly significant effect attributable to characteristic color. Each of the 3 red-associated figures was seen as redder than each of the other 6 figures (3 neutral figures and 3 non-red figures). There was no interaction of characteristic color with instructions.

R 7

27,036

Korpell, H.S. ON THE MECHANISM OF TONAL CHROMA IN ABSOLUTE PITCH. *Amer. J. Psychol.*, June 1965, 78(2), 298-300. (Cornell University, Ithaca, N.Y.).

Observers adept at the identification of absolute pitch were presented musical tones which had been re-recorded at a speed different from the original recording. These notes of new frequencies retained their original overtone characteristics. Since tone chroma, the quality by which each note of the scale may be identified as phenomenally distinct, must arise in either the proximal or the distal stimulus, and since the Os identified the tones correctly according to the frequency at which they were played as test-stimuli, and not according to the overtone structure which corresponded to a note of a different frequency, it is concluded that chroma arises as a result of the non-linear response of the ear.

R 4

27,037

Epstein, W. PERCEPTUAL INVARIANCE IN THE KINETIC DEPTH-EFFECT. *Amer. J. Psychol.*, June 1965, 78(2), 301-303. (University of Kansas, Lawrence, Kan.).

To determine whether both internal depth and amount of turning can be accurately judged under varying lengths of transformation in the kinetic depth-effect situation, judgments of depth and turning were obtained from the same Ss. The shadow casting figure was a wire parallelogram containing one diagonal bent so the upper and lower triangles formed a 120° angle with each other. 7 comparison forms were likewise bent 90°-150° in 10° steps. All were mounted on vertical axes. 75 Ss made judgments, each for only one of the 5 arcs of oscillation 15°, 25°, 45°, 65°, 85°. Judgments of internal depth deviated from complete accuracy by 1.34° to 5.00°; there were no significant differences in judgment for the various arcs of oscillation. Judgments of turning deviated by 3°-9°; again there were no significant differences in terms of the arcs of oscillation.

R 6

27,038

Davies, D.R. & Krkovic, A. SKIN-CONDUCTANCE, ALPHA-ACTIVITY, AND VIGILANCE. *Amer. J. Psychol.*, June 1965, 78(2), 304-306. (University of Leicester, Leicester, England & University of Zagreb, Zagreb, Yugoslavia).

An Exp. is reported in which the relationship between skin-conductance, alpha-activity, and auditory vigilance was studied. A trend-analysis shows that these 3 measures appear to be associated over a 90-min. vigil. The results seem to indicate that during the course of a vigil S becomes drowsy, as shown by the decrease in EEG alpha-activity, skin-conductance, and the level of performance. It is also confirmed by the S's replies to a questionnaire. It is suggested that this drowsiness is produced by the lack of varied stimulation from the task and from the environment.

R 5

27,039

Heinemann, E.G. & Nachmias, J. ACCOMMODATION AS A CUE TO DISTANCE. *Amer. J. Psychol.*, March 1965, 78(1), 139-142. (Brooklyn College, New York, N.Y. & University of Pennsylvania, Philadelphia, Penn.).

This note points out some difficulties with Wallach and Norris' conclusion that "accommodation can function as a potent cue to distance" as based on a recently reported study. These include: a) evidence that convergence changes unaccompanied by accommodation changes, have been demonstrated as sufficient to produce changes in apparent size; b) the assumption that apparent distance and apparent size vary as postulated cannot be taken for granted since the opposite relationship has been recently demonstrated; c) the fact that it is not known whether the standard or variable remained constant in size while the size of the other changed under one condition; and d) the misinterpretation of per cent size change per diopter of accommodation in the present authors' study.

R 6

27,040

Ganz, L. & Day, R.H. AN ANALYSIS OF THE SATIATION-FATIGUE MECHANISM OF FIGURAL AFTER-EFFECTS. *Amer. J. Psychol.*, Sept. 1965, 78(3), 345-361. (University of California, Riverside, Calif. & University of Sydney, Sydney, Australia).

The prolonged inspection of visual figures has been reported to have the following 2 consequences: a) visual objects are displaced away from the region of inspection; b) visual objects are more difficult to detect in this region. The hypothetical constructs employed in work on figural after-effects suggest specific relationships between these 2 consequences of prolonged fixation. In the present experiments, the displacement and detection of test-figures at a variety of distances from the inspection-figure were measured. The results indicate that displacements sometimes occur toward areas of heightened detection-thresholds. Furthermore, displacements occur from one area to another which do not differ with respect to their detection-thresholds. Finally, when a dichoptic presentation is employed, displacements can be induced without concomitant threshold-changes. It is concluded that figural after-effects probably are not due to the displacement of figures away from regions of greater neural fatigue or 'satiation.'

R 26

27,041

McCollough, Celeste. THE CONDITIONING OF COLOR-PERCEPTION. *Amer. J. Psychol.*, Sept. 1965, 78(3), 362-378. (Oberlin College, Oberlin, Ohio).

For a period of 75 days, the author wore before the right eye a spectacle containing blue-green glass on the left and red glass on the right. The left eye was occluded. Objective measurements after 5 and after 9-10 weeks failed to give evidence of gaze-contingent differences in color-perception by either eye, although the right fovea showed less sensitivity than the left fovea to both red and to blue-green. This study was undertaken as a replication of experiments reported by Ivo Kohler, in which gaze-contingent color-differences were observed following a 2-month exposure to blue and yellow spectacles. Kohler interpreted these differences as "conditioned sensations." Since the replication revealed no gaze-contingent differences, it is doubtful that Kohler's finding can be attributed to conditioning. It is suggested that homogeneous adaptation of the nasal retina to blue on one side and to yellow on the other may have played an important role in his observations. In Kohler's measurements, a neutrally illuminated surround was visible either in the left or in the right periphery, beginning at 20° from fixation. Since gaze-direction determined the side on which this periphery was visible, the apparent color of the surround likewise was dependent on gaze-direction and may have influenced the color-appearance of the foveally fixated test-field.

R 7

27,042

Kaufman, L. & Pitblado, C. FURTHER OBSERVATIONS ON THE NATURE OF EFFECTIVE BINOCULAR DISPARITIES. *Amer. J. Psychol.*, Sept. 1965, 78(3), 379-391. (Sperry Rand Research Center, Sudbury, Mass.).

This paper represents an effort to trace the broad outlines of the stimulus conditions relevant to stereopsis. The observations here suggest that relative brightness disparities are both necessary and sufficient stimuli for stereopsis. This is consistent with the results from another researcher's work which suggest that chromatic color may be a second relevant dimension. In the present demonstration it was also shown that there need be no contour-similarity between display elements for them to be seen in depth as a result of brightness disparity. Also when brightness disparities in small local regions are in conflict with those of larger regions, both can be responded to at different times. It is felt that Whittle's hypothesis about Helmholtz's negative contrast patterns is substantiated. The notion that contour is essentially irrelevant as a basis for stereopsis is of some importance. It has been suggested that, even if rivalry is present in a stereogram, the contours can still fuse to produce stereopsis. It should be evident from these demonstrations that not only is rivalry present but that there are also no contours, subjective or real, which could conceivably fuse in some projection-field. Moreover, the rivalry can be seen to occur between the different surface-colors employed in the patterns. Sometimes one sees a black letter and then a gray letter of the same shape in the same place. We cannot, therefore, accept the notion that rivalry is complementary to stereopsis in the sense that its occurrence between the relevant disparate dimensions destroys stereopsis. At the very least, rivalry is a relatively independent phenomenon. It is, however, more likely that rivalry reflects the nature of the processing performed by the nervous system to ascertain the depth-relations.

R 8

27,043

Teghtsoonian, Martha. THE JUDGMENT OF SIZE. *Amer. J. Psychol.*, Sept. 1965, 78(3), 392-402. (Smith College, Northampton, Mass.).

Judged size, scaled by the method of magnitude-estimation, is related to physical size by a power function. The exponent of the power function may take a value of 1.0--that is, judged size may be in direct correspondence to physical size--only under special circumstances: a) for judgments of linear dimensions; and b) when area-ratios can be successfully determined on the basis of judgments of length and physical area is estimated. When S is asked to judge the apparent size of 2- and 3-dimensional figures, the exponent of the power function is appreciably less than unity. For 2-dimensional figures, this value is about 0.8, and for 3-dimensional figures, it is about 0.7. Neither value appears to be greatly influenced by the form of the figures studied.

R 10

27,044

Brent, S.B. ORGANIZATIONAL FACTORS IN LEARNING AND REMEMBERING: FUNCTIONAL UNITY OF THE INTERPOLATED TASK AS A FACTOR IN RETROACTIVE INTERFERENCE. *Amer. J. Psychol.*, Sept. 1965, 78(3), 403-413. (Wayne State University, Detroit, Mich.).

2 experiments are reported in which we varied internal structure of the interpolated learning-material, in an experimental paradigm for retroactive inhibition, along a dimension referred to as degree of functional unity. It was hypothesized that increasing functional unity should make items within the interpolated learning-structure less available to interfere with original learning during relearning, hence that retroactive interference should vary inversely and continuously with degree of functional unity of the interpolated learning material. The results, however, indicated that while: a) rate of interpolated learning varied directly and continuously with functional unity; b) amount of retroactive interference varied inversely and discontinuously with functional unity, such that the highest functional unity condition resulted in the least retroactive interference, while the intermediate and lowest conditions resulted in more retroactive interference than the highest condition, and, at the same time did not differ from each other. The difficulties posed by these findings for existing theories of learning and memory interference are discussed.

R 6

27,045

Larimer, G.S. AMBIGUITY AND NEARNESS OF ANCHORS AS FACTORS IN ASSIMILATION. Amer. J. Psychol., Sept. 1965, 78(3), 414-422. (University of New Brunswick, Fredericton, New Brunswick, Canada).

5 groups of Ss judged a series of distances between lights under standardized and variable conditions, i.e. with the introduction of an anchor. Under the standard condition the Ss were allowed to establish their own scales. Under the variable condition, Group I judged the original series in the presence of an ambiguously near anchor (A-NA); Group II, in the presence of an unambiguously near anchor (UA-NA); Group III, in the presence of an ambiguously medium anchor (A-MA); and Group IV, in the presence of an unambiguously medium anchor (UA-MA). In all cases the anchor was also judged. Group V, the control group (C), judged the series without the introduction of an anchor. Significant displacements occurred in the judgments of Groups I and II (the MA-NA and A-MA groups). Groups II and IV (the UA-NA and UA-MA groups) enlarged their judgmental scales by adding new categories adjacent to their original scale to include the anchors. Practice was found to account for changes in judgments of the original series.

R 12

27,046

Kinney, Jo Ann, S., & Connors, Mary M. RECOVERY OF FOVEAL ACUITY FOLLOWING EXPOSURE TO VARIOUS INTENSITIES AND DURATIONS OF LIGHT. Amer. J. Psychol., Sept. 1965, 78(3), 432-440. (USN Medical Research Lab., Groton, Conn.).

The study was designed to measure the effect of various durations and intensities of light on the acuity-threshold of the dark-adapted fovea, by determining the time necessary to readapt following these exposures. The adapting lights were always presented foveally and varied in brightness from 0.36 to 3,000 ft-L., and in duration from 1 to 45 sec. The resulting families of dark-adaptation curves show that the times necessary to readapt to the previously determined acuity-threshold vary systematically with the intensity and duration of exposure, from essentially zero for dim, brief lights to a maximum of about 5 min. for the longer, brighter ones. A most interesting aspect of the data is that the product of intensity and time gives a constant effect. When readaptation-time is plotted against  $1 \times T$ , a single curve results, which quite adequately fits the data-points.

R 30

27,047

Thompson, C.I., Fidura, F.G., Rhoads, C.J., DeYoung, C.A., et al. THE RELATION BETWEEN PULSE-TO-CYCLE FRACTION AND CFF. Amer. J. Psychol., Sept. 1965, 78(3), 448-454. (Ohio University, Athens, Ohio).

PCF-crossings were obtained by varying flicker-frequency for 9 combinations of PCF and intensity. After the crossing points were determined, the corresponding CFF- and intensity-values were held constant while PCF was varied from 0.02-0.98. The majority of these series produced 2 flicker-to-fusion or fusion-to-flicker transitions, while 3 transitions occurred for 3 Os. Bartley's original neurophysiological model provides a fairly accurate explanation of the retinal behavior involved.

R 5

27,048

Epstein, W. & Franklin, S. SOME CONDITIONS OF THE EFFECT OF RELATIVE SIZE ON PERCEIVED RELATIVE DISTANCE. Amer. J. Psychol., Sept. 1965, 78(3), 466-470. (University of Kansas, Lawrence, Kan.).

2 experiments examined the conditions which govern the effect of relative size on relative distance. 2 variables were studied: a) size-ratio vs. absolute size-difference; and b) shape-similarity. It was found that variations in size-ratio are necessary to produce variations in perceived relative distance. Similarity of shape is unnecessary.

R 6

27,049

Colgan, C.M. THE EFFECT OF OBSERVATIONAL TECHNIQUE ON BRIGHTNESS-ENHANCEMENT. Amer. J. Psychol., Sept. 1965, 78(3), 471-475. (University of South Carolina, Columbia, S.C.).

Using the method of adjustment, each of 3 groups of 12 Ss matched a steady light to a flickering light in terms of brightness for each of 17 different flash-rates. The groups differed in instructions. The maximal enhancement occurred at 4-5 cps for all 3 groups. There was greater enhancement in a group making its matches on the basis of the on period alone than in a group using both on-and-off periods, or for a group given no special instruction.

R 8

27,050

Turnure, Cynthia & Wallach, Lise. THE INFLUENCE OF CONTEXTUAL VARIATION ON THE DIFFERENTIATION OF PARTS FROM WHOLES. Amer. J. Psychol., Sept. 1965, 78(3), 481-485. (Yale University, New Haven, Conn. & University of North Carolina, Chapel Hill, N.C.).

The results of 2 experiments support the hypothesis that a stimulus which is presented in varying contexts is more likely to be differentiated from its surroundings and recognized in subsequent situations than a stimulus which always occurs in the same context.

R 4

27,051

Lehman, R.S. EYE-MOVEMENTS AND THE AUTOKINETIC ILLUSION. Amer. J. Psychol., Sept. 1965, 78(3), 490-492. (University of Colorado, Boulder, Colo.).

The research reported demonstrates 2 relationships between eye-movements and the autokinetic illusion: a) eye-movements are consistently related to the onset of autokinetic movement; and b) eye-movements are consistently related to starts, stops, and changes in direction of autokinetic movement.

R 8

27,052

Suedfeld, P., Vernon, J., Stubbs, J.T. & Karlins, M. THE EFFECTS OF REPEATED CONFINEMENT ON COGNITIVE PERFORMANCE. Amer. J. Psychol., Sept. 1965, 78(3), 493-495. (Princeton University, Princeton, N.J.).

Replication of a previous study showed that sensory deprivation adversely affects performance in an unstructured cognitive task. Sensorially deprived Ss told shorter stories after than before 24 hr. of confinement, while isolated but not deprived Ss told longer post-confinement stories. Both of these effects disappeared when the Ss underwent a second 24-hr. confinement.

R 4

27,053

Churchill, A.V. VISUAL-KINESTHETIC LOCALIZATION. Amer. J. Psychol., Sept. 1965, 78(3), 496-498. (Defence Research Medical Labs., Toronto, Ontario, Canada).

This experiment was designed to compare the accuracy of localization with the left and right hands when a position located kinesthetically was reported on a visual scale, and when a position located visually was indicated on a nonvisual scale. The results of this study partly confirm the original observation, and further suggest that there is little difference in the accuracy with which Ss perform under the 2 experimental conditions, the main difference being in the directional bias of the error (mean CE  $-2.10^\circ$  under Condition 1, and Mean CE  $+2.00^\circ$  under Condition 2). The results suggest, also, that with right-handed Ss, performance is more accurate with the right hand (over-all ME  $2.16^\circ$ ), than with the left hand (over-all ME  $4.37^\circ$ ).

27,054

Eisler, H. THE CEILING OF PSYCHOPHYSICAL POWER FUNCTIONS. Amer. J. Psychol., Sept. 1965, 78(3), 506-509. (University of Stockholm, Stockholm, Sweden).

Subjective force exerted by pushing a pedal with the foot was scaled by the method of magnitude estimation. The validity of the psychophysical power law was demonstrated for the whole dynamic range up to the strongest forces the Os were capable of exerting.

R 4

27,055

Piggins, D.J. AUTOKINESIS WITH AN AFTER-IMAGE. Amer. J. Psychol., Sept. 1965, 78(3), 509-510. (University of Waterloo, Waterloo, Ontario, Canada).

3 viewing conditions--steady fixation of small light, same with an adjacent after-image, and observation of after-image alone--were used. 25 Ss were exposed once to each condition. For condition 1, all Ss experienced movement; for 2, 15 Ss reported only after-image movement and 4 only stimulus movement and the others reported combined outcomes; for 3, all Ss reported movement of the after-image. These mixed findings suggest both eye movement and central processes contributions to the phenomenon.

R 3

27,057

Harris, J.D. MONAURAL AND BINAURAL SPEECH INTELLIGIBILITY AND THE STEREOPHONIC EFFECT BASED UPON TEMPORAL CUES. Laryngoscope, March 1965, LXXV(3), 428-446. (USN Medical Research Lab., Groton, Conn.). (Reprint) (AD 622262)

A stereo tape was prepared using 3 talkers separated in  $30^\circ$  azimuth steps. 9 ways of connecting the 2 channels to the 2 ears were devised, and administered to normal ears and to monaurally defective individuals. 4 principles of binaural interaction were enunciated: The Principle of Binaural Gain, the Principle of Redundancy, the Principle of Blurring, and the Principle of Degradation. These principles consider the advantage of a second neural channel, a second 'look' at the stimulus with the same ear, confounding results from receiving information in one ear from noncongruent points in space, and the disadvantage of mixing signals from a normal ear and one in which signals are garbled as a result of a pathological condition. In any one person, speech intelligibility will be the algebraic resultant of whatever principles are operating at the moment.

R 35

27,058

Beasley, G.P. & Pennington, J.E. RANGE ESTIMATION OF FAMILIAR TARGETS PRESENTED AGAINST A BLACK BACKGROUND. NASA TN D 2845, Oct. 1965, 23pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Hampton, Va.).

A series of tests has been conducted to determine the human ability to judge range with no cues except the apparent size of the object viewed. This visual situation could occur in many space operations. Ss were asked to estimate the distance to targets of known size placed at random distances and uniformly illuminated. The targets were a plane triangle, a disk, and 3 proportional cylinders. The tests were conducted in a 2800-ft-long darkened building. Results show that Ss tended to overestimate the range of the smaller models and to underestimate the range of the larger models. Ss were able to estimate accurately the range of receding targets at much greater ranges than that of approaching targets. It appears possible to apply the pilot's visual acuity (the ability to distinguish fine detail) to make estimated accurate over a greater range. The point at which the size and shape of a particular target can first be resolved could determine a specific range on which subsequent estimates could be based. This possibility was not investigated in this test series, but such a technique, based on test results, is suggested.

R 9

27,059

Berko, M.J. "PHENOMENAL DISPLACEMENT" IN DELAYED AUDITORY FEEDBACK: II. HIGH INTENSITY EFFECTS. Psychonomic Science, June 1965, 2(12), 389-390. (Cornell University, Ithaca, N.Y.).

It was previously demonstrated with 10 Ss that the speech disruptive effect of delayed auditory feedback (DAF) was significantly reduced when there was, instead of equal intensity of fed-back input to each ear, a marked disparity of inter-aural intensity. The findings were interpreted as implying that the disruptive effect of DAF was related to the phenomenal localization of the feedback. It was later suggested that the effect noted might simply reflect a reduction of intensity in 1 headphone to a degree allowing the Ss to receive some non-delayed feedback. The experiment was redesigned to overcome this objection by achieving disparity of intensities by raising rather than lowering the input to 1 headphone. The originally reported effect was retained.

R 2

27,060

Erickson, R.A. VISUAL DETECTION OF TARGETS: ANALYSIS AND REVIEW. WepTask RAV32 N001/216 1/FO08 02 002, NOTS Tech. Publication 3645, NAVWEPS Rep. 8617, Feb. 1965, 56pp. USN Ordnance Test Station, Aviation Ordnance Dept., China Lake, Calif.

This report discusses many of the aspects of air-to-ground visual search for targets. Curves are presented that can be used for estimating the probability that a ground target is within view and for determining the angular rate of the target as measured with respect to the air observer. Optical aspects (clouds, atmospheric attenuation, reflectance factors) of visual detection are discussed briefly and references from which data can be obtained are cited. A number of laboratory experiments concerning visual detection are described, and some of the results are given. Examples of simulation, operational, and mathematical methods of obtaining estimates of search performance are given and compared.

R 88

27,061

Snyder, H.L. & Calhoun, R.L. LABORATORY STUDIES IN AIR-TO-GROUND TARGET RECOGNITION. I. PROGRAM DESCRIPTION AND INITIAL VISUAL RECOGNITION DATA. T5 132/3111, April 1965, 43pp. Autonetics, North American Aviation, Inc., Anaheim, Calif.

The first section of this report presents a summary of work done by the Autonetics Human Factors Department on problems of air-to-ground target recognition. It also describes a planned program of future studies. The second section presents data on visual target recognition obtained in laboratory studies and compares these data with airborne recognition data for the same targets. Results indicate that recognition probabilities for these targets were generally high both in the laboratory and in the air, but recognition ranges were substantially smaller in the laboratory.

R 18

27,062

Weasner, M.H. DETECTION OF GROUND TARGETS UNDER FLARE ILLUMINATION. DA Proj. 1X132401D050, AMCMS Code 5135.12.05010, Tech. Rep. 3266, Aug. 1965, 14pp. USA Picatinny Arsenal, Dover, N.J.

10 military ground targets (vehicles and personnel) were randomly placed in a one-square-mile test area. For each flare drop, 5 of these targets were moving and 5 were stationary. A total of 33 flares were dropped during the 3 night tests. The flares varied in intensity from 500,000 to 2,000,000 candlepower and in burning time from 30 to 120 seconds. 6 aerial observers flew at altitudes of 2500 to 5500 feet and distances from ground zero (center of test area) of 1000 to 6000 meters. They were instructed to record the targets that they detected, to identify them, if possible, and to locate them, if possible, by referencing them to a grid of numbered and lettered squares. 15% of the stationary vehicles were detected while only 1% were identified. 5% of the moving vehicles were detected while 1% were identified. Only one observer on one flare drop reported that he might have seen a squad of men. There were no other sightings of personnel.

R 9

27,063

Oatman, Lynn C. TARGET DETECTION USING BLACK-AND-WHITE TELEVISION. STUDY III: TARGET DETECTION AS A FUNCTION OF DISPLAY DEGRADATION. AMCMS Code 5026.11.81900, Tech. Memo. 12 65, Sept. 1965, 22pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

2 previous studies have examined the probability of detecting an M-48 tank on a black-and-white closed-circuit television (TV) system, with apparently conflicting results. When only horizontal resolution was reduced to get resolutions of 300, 400, 600, and 800 lines, detection performance was essentially the same for the 3 highest resolutions, though significantly poorer for the 300-line resolution. Yet when resolution was reduced in both horizontal and vertical dimensions, 800-line resolution gave better detection performance than 450-line resolution did. Extraneous variables that could not be controlled--such as uneven brightness and resolution on the TV monitors themselves--made it difficult to interpret these results. Thus it was not clear whether the first result was an unlikely chance event or whether resolution's effect depends on the number of dimensions reduced. The present study replicated the first one to test its verifiability. Displays at all 4 levels of resolution were presented to 20 Ss, who were asked to indicate in which one of 9 areas the tank appeared on the TV screen. The results verified those of the first study: the Ss detected targets about equally well with the 800-, 600-, and 400-line resolutions, but their performance was significantly poorer with 300-line resolution. This finding suggests that, if resolutions are equal, reducing both horizontal and vertical dimensions will impair detection performance more than reducing just horizontal resolution (i.e., reducing bandwidth). The effects of the tank's location on the TV screen, although probably an important determinant of target-detection probability, again proved impossible to isolate from various extraneous variables.

R 8

27,064

Evans, L.A., Levy, G.W. & Ornstein, G.N. VALIDATION STUDY OF A TARGET IDENTIFICATION MODEL. FINAL REPORT, 28 June 1961-31 JULY 1965, 32pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (North American Aviation, Inc., Columbus, Ohio).

A research program was undertaken to assess the validity of a previously developed mathematical model for predicting target identification probabilities. A major Validation Study and 3 auxiliary studies were conducted. The purpose of the Validation Study was to compare predictions of the model with empirically obtained probabilities. Stimulus materials were generated by filming a TV monitor screen upon which was presented the scene being viewed by a TV camera as it swept over a terrain model containing various targets of differing surround and contrast. These materials were subsequently projected at 3 different projection speeds and viewed from each of 3 different distances by 3 groups of 20 Ss. Empirical probabilities for each of 54 "flight" conditions (involving variations in contrast, resolution ratio, target angular subtense, and viewing time) were experimentally obtained and were compared with probabilities estimated from these factors by a mathematical model of target identification performance. The 3 auxiliary studies were designed to investigate specific assumptions or aspects of the target identification model. Specifically, they were to determine (a) whether the predicted probability of target identification is a function of display mode (static or dynamic); (b) whether performance is a function of target size independent of the relative proportion of the field of view occupied by the target; and (c) whether the target identification model predicts equally well for 2 different levels of system resolution. It was concluded that the model has sufficient predictive power for the evaluation of target identification systems on a gross and relative basis.

R 11

27,065

Rodwan, A.S. A COHERENCE-CRITERION IN PERCEPTION. Amer. J. Psychol., Dec. 1965, 78(4), 529-544. (Emory University, Atlanta, Ga.).

An experiment was designed to determine whether the linear discriminant function (LDF) could serve as a model for perceptual psychophysics as well as a theory of recognition. The results indicated: a) that an accuracy-criterion was not met; b) that the LDF's for form and for size were clearly different; and c) that the LDF is an adequate model for predicting one class of responses (in the form-judgment it was rectangle and in the size judgment it was large). 2 counter-suggestions were considered in attempting to account for these results and the nature of the future research was described.

R 7

27,066

Corso, J.F. & Levine, M. PITCH-DISCRIMINATION AT HIGH FREQUENCIES BY AIR- AND BONE-CONDUCTION. Amer. J. Psychol., Dec. 1965, 78(4), 557-566. (State University of New York, Cortland, N.Y.).

The present study was performed to investigate pitch-discrimination for sonic and ultrasonic frequencies presented by monaural air- and by bone-conduction. 5 groups of Os with normal hearing and high pitch-ability were tested at 6 frequencies from 2000 to 57,000 at a loudness-level of 20 phons. The results obtained by the method of constant stimulus-differences indicate that: a) at 2000 the difference-limits for pitch discrimination are approximately equal for air- and bone-conduction, but from 4000-14,000 the difference-limits are significantly smaller for bone-conduction; and b) pitch-discrimination is absent for bone-conducted tones in the ultrasonic region. It is concluded that with respect to pitch-discrimination there is no functional difference between the 2 modes of acoustic transmission, but the apparent superiority of discrimination by bone-conduction suggests that there may be a loudness-difference between tones presented via air- and bone-conduction or that the role of the ossicular chain in air-conduction may impose a limiting factor on pitch-discrimination.

R 17

27,067

Wickelgren, W.A. SHORT-TERM MEMORY FOR PHONEMICALLY SIMILAR LISTS. Amer. J. Psychol., Dec. 1965, 78(4), 567-574. (Massachusetts Institute of Technology, Cambridge, Mass.).

In the first experiment 31 Ss attempted ordered recall of 2 types of 9 letter lists: phonemically similar lists in which all letters had a common vowel phoneme (ā, ē, or e) and phonemically different lists whose letters had no common phoneme. Ordered recall was poorer for similar lists ( $p < 0.001$ ), but this resulted entirely from poorer recall of the position of similar letters ( $p < 0.001$ ). Item-recall, by a free recall criterion, was not significantly different for the 2 types of lists. In the second experiment 28 Ss attempted ordered recall of the consonants only, from 2 types of lists of 7 consonant-vowel diagrams: phonemically similar lists in which the vowel was identical for all 7 diagrams (ā, ē, i, o, ō) and phonemically different lists whose 7 vowels were a mixture of the above 5 vowels. Position-recall was significantly poorer for phonemically similar lists ( $p < 0.001$ ), but item-recall was significantly better for similar lists ( $p < 0.001$ ).

R 4

27,068

Gruber, H.E. & Dinnerstein, A.J. THE ROLE OF KNOWLEDGE IN DISTANCE-PERCEPTION. Amer. J. Psychol., Dec. 1965, 78(4), 575-581. (New School for Social Research, New York, N.Y. & New York Medical College, New York, N.Y.).

The distances of nonequidistant pairs of luminous squares in a dark field were judged by college students in 2 experiments. Control groups judged without knowledge and experimental groups with knowledge of the objective distances. In Exp. I, the stimuli were of the same retinal size. Knowledge of distance influenced perceived absolute distance but not perceived relative distance. In Exp. II, the retinal-size ratio of the stimuli was varied. Again, knowledge influenced perceived absolute distance but not perceived relative distance. Stimulus-size ratio influenced perceived relative distance but not perceived absolute distance. Viewed binocularly, the stimuli appeared nonequidistant; monocularly, they seemed equidistant or almost so. By opening and closing one eye, this phenomenal shift could be repeated indefinitely. These results show that knowledge has little influence on perceived relative distance.

R 15

27,069

Spitz, H.H. EXPANSION AFTER-EFFECTS WITHOUT PERCEIVED CONTRACTION OF THE INSPECTION-FIGURE. Amer. J. Psychol., Dec. 1965, 78(4), 582-588. (Edward R. Johnstone Training & Research Center, Bordentown, N.J.).

A new figure consisting of fragmented circles was abstracted from an illusory spiral. These fragmented circles did not create the impression of contraction while spinning, but did produce an after-effect expansion on an appropriate stationary test-figure. After-effects of contraction, however, could not be induced. Possible explanations for these results were posited. Field effects on after-effects of movement were also reported.

R 6

27,070

Parker, Nora I. & Newbigging, P.L. DECREMENT OF THE MULLER-LYER ILLUSION AS A FUNCTION OF PSYCHOPHYSICAL PROCEDURE. Amer. J. Psychol., Dec. 1965, 78(4), 603-608. (McMaster University, Hamilton, Ontario, Canada).

In this experiment decrement to the M-L illusion over trials was investigated as a function of psychophysical procedure. 4 procedures were compared. In the first, the typical procedure employed with the Method of Average Error, shorter and longer settings of the variable (the extent between the 'open' angles) were randomly intermixed. In the second only the shorter of the settings used in the mixed procedure were employed, while in the third the longer settings were used. In the fourth and final procedure the variable was always set to physical equality prior to S's adjustment. The results showed that only the first 2 procedures noted produced a significant decrement to the illusion over trials. Since the last 2 procedures had been used in studies in which the decrement was not obtained under a variety of conditions, it is concluded that the failure is probably attributable to the psychophysical procedure employed. It is further concluded that the greater effectiveness of the mixed procedure in bringing about the decrement may be attributed to the more varied conditions it provides for the comparison of the horizontal extents, and learning is therefore facilitated.

R 7



27,071

Pollack, I. & Johnson, L.B. MEMORY-SPAN WITH EFFICIENT CODING PROCEDURES. Amer. J. Psychol., Dec. 1965, 78(4), 609-614. (USAF Systems Command, Bedford, Mass.).

Binary verbal messages and tachistoscopic materials were presented before, and after, instruction with a binary to decimal digit-code. Confirming Smith, we find substantial improvements in memory-span for verbal messages after coding. We also find little change for tachistoscopic materials. The effect of coding is enhanced by compatible message formats and at slow rates of presentation. Effective utilization of efficient coding procedures requires sufficient time for recording operations.

R 4

27,072

Siegel, R.J. A REPLICATION OF THE MEL SCALE OF PITCH. Amer. J. Psychol., Dec. 1965, 78(4), 615-620. (Queens College, Flushing, N.Y.).

In view of conflicting reports on the nature of the mel scale, the present study was performed. Using the same techniques as Stevens and his associates, results were different. It is felt that the nature of the room used in Steven's experiments and the ages of the Ss tended to lower perceived pitch of the higher tones. Because of this, the mel curve derived in the present experiment appears to the author to be more valid. The present finding indicates that the mel curve of subjective pitch vs. frequency is of the same form as the same curve of subjective loudness--that is, an exponential curve. (HEIAS)

R 7

27,073

Jones, M.B. INDIVIDUAL VARIATIONS IN THE POSTOCULAR LINES OF REGARD. Amer. J. Psychol., Dec. 1965, 78(4), 627-633. (University of Florida, Gainesville, Fla.).

A straight edge was set up directly in front of, at the same level as, and pointing directly at S's one open eye in monocular vision. S was then asked to indicate when a touch on his scalp seemed to him to be lined up with the straight edge. So defined, the right and left postocular lines were found generally to lie closer to the midline of the head than to the respective optical axes. The midpoint of the 2 lines lay consistently to the left of the midline. The variance of the left was greater than the variance of the right postocular line. And intra-class correlation in a collection of 26 sets of identical twins was greater for the right line than for the left. Hand- and eye-dominance seemed not to bear upon the results. The interpretation was offered that both postocular lines are influenced by both heredity and environment, that environmental influences produce the leftward tendency of the 2 lines, and that this tendency is more powerfully felt in the left line.

R 3

27,075

Bevan, W. & Turner, E.D. THE POTENCY OF A LIGHTNESS-ANCHOR AS A FUNCTION OF THE REFLECTANCE OF ITS BACKGROUND. Amer. J. Psychol., Dec. 1965, 78(4), 645-650. (Kansas State University, Manhattan, Kan.).

60 Ss, divided at random into 6 groups of 10 each, judged the lightness of gray patches presented one at a time in a Gerbrands tachistoscope. One group, the control, received only the stimulus-series on a medium gray ground. The other 5 received, in addition, an anchor below the series in lightness, one on a background with reflectance equal to that of the series, the others each on a lighter or darker ground. Results indicate that the magnitude of the effect of the anchor was directly related to the relative lightness of the ground. The greatest effect of the anchor was produced when the dark gray anchor appeared on a white background; the weakest when the dark gray anchor appeared on a black background.

R 13

27,076

Templeton, W.B., Howard, I.P. & Easting, G. SATIATION AND THE TILT AFTER-EFFECT. Amer. J. Psychol., Dec. 1965, 78(4), 656-659. (University of Durham, Durham, England).

Both Kohler's satiation theory and Gibson's adaptational theory can account for the well-known after-effect of a tilted line on the apparent vertical. The question of whether there are in fact 2 mechanisms was investigated by setting up a condition in which only the figural after-effect could be expected to occur; viz. a vertical inspection-figure and a tilted test-figure. Although an effect was obtained in this condition, it was significantly smaller than that found for the tilt after-effect. This was interpreted as evidence that both mechanisms operate.

R 4

27,077

Adamthwaite, Myra & Shaffer, Juliet P. ASSIMILATION AND ATTENTION IN VISUAL FORM-PERCEPTION. Amer. J. Psychol., Dec. 1965, 78(4), 664-667. (University of Kansas, Lawrence, Kan.).

This experiment consisted of obtaining reproductions of a single geometric figure under all combinations of stimulus presentation (1 figure observed; this stimulus followed by another; this stimulus preceded by another) and mode of presentation (standard; distraction; speed stress). Assimilative scores were significantly higher when: a) an additional stimulus was presented; and b) distraction and speed stress were present. Assimilative scores increased when attention-reducing models of observation were introduced even if only a single figure had been observed (and thus no true assimilation could occur). Therefore, this study finds no support for the hypothesis that assimilation is increased under conditions of reduced attention. (HEIAS)

R 1

27,078

Chenzoff, A.P. & Folley, J.D., Jr. GUIDELINES FOR TRAINING SITUATION ANALYSIS (TSA). FINAL REPORT. Contract N61339 1218, Proj. 7568, Tech. Rep. NAVTRADEVEN 12 18 4, July 1965, 190pp. USN Training Device Center, Port Washington, N.Y. (Applied Science Associates, Inc., Valencila, Penn.). (AD 472155)

These guidelines represent a textbook for instruction in 3 phases of Training Situation Analysis (TSA), a standardized procedure, developed by NTDC, for systematically gathering and interpreting the information which is relevant to the planning of training and training devices. 3 phases of TSA are described in detail: System Familiarization, Task Analysis Method (TAM) and Training Analysis Procedure (TAP). System Familiarization provides an orientation to the training problem, the system structure and flow, and the equipment. Task Analysis Method produces a set of task descriptions containing the information necessary for making training device decisions. Training Analysis Procedure produces a ranking of tasks based upon the potential benefit to system performance as a result of training and the cost of that training. Recommendations for the conduct of these 3 phases and suggested working forms are presented.

27,079

Frederiksen, N. RESPONSE SET SCORES AS PREDICTORS OF PERFORMANCE. Personnel Psychol., Autumn 1965, 18(3), 225-244. (Research Div., Educational Testing Service, Princeton, N.J.).

A Work Preference Schedule (WPS), containing items concerned with preferences for a variety of job attributes, was administered to federal government employees in connection with routine personnel procedures. Answer sheets were obtained and rescored to yield scores which would presumably reflect social desirability and extremity response sets. Statistical study of the scores showed that response sets could be reliably measured and that attractive and unattractive items should be studied separately. Correlations of set scores with biographical data and with scores from inventories and tests were computed, including scores from a situational test, the Bureau of Business In-Basket Test. It was judged that the only correlations that were capable of reasonably unambiguous interpretation were those between in-basket scores and desirability set scores obtained from unattractive items. The results show that those who try to put themselves in a good light in responding to the WPS are likely to follow leads suggested by their superior in the in-basket situation and to show generally good performance both in terms of quantity and quality. Some underlying motivational variable such as anxiety or need for recognition may account for both the desirability response bias and the characteristics of the in-basket performance.

R 24

27,080

Jones, D.H. & Carron, T.J. EVALUATION OF A READING DEVELOPMENT PROGRAM FOR SCIENTISTS AND ENGINEERS. Personnel Psychol., Autumn 1965, 18(3), 281-295. (University of Detroit, Detroit, Mich. & Ethyl Corporation, New York, N.Y.).

Previous investigations of reading improvement have failed to agree on the relative effectiveness of machine vs. book-centered training methods. In this report of gains achieved and retained by 114 scientists and engineers, 42 Ss were trained with the aid of mechanical equipment and 72 by means of a book-centered method. Equated forms of the Diagnostic Reading Tests were used as criteria of success. All participants had gained significantly in rate, comprehension, and index at the completion of training. However, follow-up 18 months later clearly showed the superiority of book-centered training. A statistical analysis of pre-, post-, and follow-up scores is presented, as well as correlation of reading gains with other psychometric data.

R 24

27,081

Mahoney, T.A. & England, G.W. EFFICIENCY AND ACCURACY OF EMPLOYEE SELECTION DECISION RULES. Personnel Psychol., Winter 1965, 18(4), 361-377. (University of Minnesota, Minneapolis, Minn.).

This article re-examines the traditional approaches to decision-making in employee selection, points out some implicit assumptions which often are overlooked, and offers a more precise approach to the development and application of a decision rule. The general framework for discussion is: a relatively standardized, repetitive decision such that N candidates must be selected over a specified period; an employee effectiveness criterion of success and failure; and application of a single predictor measure in employee selection. 2 practical decisions are involved in the development and installation of an employee selection decision rule in this situation: a) what is the optimal decision rule for selection which can be based upon the predictor scores available?; b) given the optimal decision rule, does the expected benefit of application of the decision rule outweigh the expected cost? Major attention has been devoted to the 1st of these questions in the usual treatment of selection decision rules; the 2nd question rarely is treated in a formal manner. In the next section, we briefly review the traditional guides to the development of employee selection decision rules, and in following sections we propose somewhat more relevant guides.

R 6

27,082

Guion, R.M. & Gottier, R.F. VALIDITY OF PERSONALITY MEASURES IN PERSONNEL SELECTION. Personnel Psychol., Summer 1965, 18(2), 135-164. (Bowling Green State University, Bowling Green, Ohio & Findlay College, Findlay, Ohio).

This article attempts to report in summary form the nature of and results of a sampling of research studies featuring personality measures in current use. It is not intended to be a thorough survey of each test; it simply tries to summarize the literature in 2 major sources of published reports: the Journal of Applied Psychology and Personnel Psychology. 12 volumes of each of these journals were examined, from 1952-1963. A summary table evaluates each test under the following headings: Test, Job N, Criterion, Method, Results, Type of validity, Cross validation procedures, and Reference. The major conclusions of the authors are as follows: a) Research designs are, by and large, consistently inadequate. Concurrent validation is done more often than predictive. The criterion measures are typically inappropriate, suggesting that personality measures have often been used where no serious hypothesizing has been done; b) The rawest form of situational empiricism, despite growing unrest with it, still seems to result in better prediction than more sophisticated psychological theory; c) Taken as a whole, there is no generalizable evidence that personality measures can be recommended as good or practical tools for employee selection. The best that can be said is that in some situations, for some purposes, some personality measures can offer helpful predictions. (HEIAS)

R 93

27,083

Rohles, F.H., Jr. CONSIDERATION FOR ENVIRONMENTAL RESEARCH IN HUMAN FACTORS. J. environ. Sciences, June 1965, 8(3), 18-20. (Environmental Research Institute, Kansas State University, Manhattan, Kan.).

This brief article points out the many variables that must be taken into account and preferably controlled, in all environmental research. These include: organismic factors--sex, age, diet, circadian rhythmicity, basal metabolic rate; physical factors--sound, light, area-volume, radiation, inspired air, atmospheric pressure, force field, air movement, temperature-humidity; and reciprocative factors--activity, clothing, exposure, social.

27,084

Larue, M.A., Jr. THE EFFECTS OF VIBRATION ON ACCURACY OF A POSITIONING TASK. J. environ. Sciences, Aug. 1965, 8(4), 33-35. (Martin Company, Orlando, Fla.).

An experimental program was undertaken to determine what degradation in accuracy would occur if man were required to perform a positioning task in a vibration environment. Of particular concern were the frequency levels in the 5-22.5 cps range. It was concluded that, for the positioning task utilized, man in a vibration environment can achieve accuracy levels equal to those which he can achieve in a static environment as long as the frequencies are kept above approximately 5 cps.

27,085

Maloney, J.A. MAN-RATED CHAMBER CONSIDERATIONS FOR SIMULATED TESTS OF GEMINI SPACECRAFT. J. environ. Sciences, Aug. 1965, 8(4), 37-43. (McDonnell Aircraft Corporation, St. Louis, Mo.).

The experience gained in designing and developing McDonnell's man-rated 30-ft. diameter space-simulation chamber is used as a basis in discussing the man-rating of space chamber facilities. The chamber structure and associated systems necessary in providing a safe environment for both chamber observers and occupants of the spacecraft are reviewed. Various design approaches are outlined and the optimum one selected to achieve a man-rated facility with maximum safety. Structural design, material considerations, repressurizations, non-contaminant conditions, and other man-rated features are discussed in detail. Safety requirements, training and bio-medical facilities integrated with the chamber complex are reviewed in terms of the Gemini Spacecraft space-simulation tests. Proposed improvements and recommendations for design of future man-rated chambers are presented.

R 19

27,086

Kohara, J. THE APPLICATION OF HUMAN ENGINEERING TO DESIGN, CHAIR, BED, VEHICLE SEAT. Nov. 1965, 67pp. Design Institute, Illinois Institute of Technology, Chicago, Ill.

This paper discusses a human engineering approach to the design of chairs and beds, as applied to Japanese needs. Anthropometry, the relation of the body to supporting surfaces, contact pressures, electromyographic recordings, fatigue, shape of supporting structures, and the construction of cushion materials are discussed. Tables and graphs in support of the technical points are found by referral to a book (in Japanese) "The Designer as a Scientist--Application of Human Engineering to Furniture Design" by the same author.

R 4

27,087

Rushton, W.A.H. A FOVEAL PIGMENT IN THE DEUTERANOPE. J. Physiol., Jan. 1965, 176(1), 24-37. (Physiological Lab., University of Cambridge, Cambridge, England).

The foveal pigments in the deuteranope were investigated by the technique of retinal densitometry. A pigment was found that was more red-sensitive than the chlorolabe of the protanope, for it could be bleached by a deep red light that did not affect chlorolabe and after bleaching showed a density change at 635 m $\mu$  where chlorolabe is transparent. Only 1 pigment is present in the red-green range since the change in reflectivity of the fovea is identical when half bleaching is produced by deep red light or by blue-green. This single pigment erythrolabe is a visual pigment since its action spectrum coincides with the visibility spectrum of the deuteranope. Lights of various wave-lengths adjusted in intensity to bleach erythrolabe equally were judged by the deuteranope to look equally bright (flicker photometry). The serious nature of contamination of results by stray light is discussed and illustrated by a brief sketch of the 8 yrs' work upon the material of this paper.

R 12

27,088

Rushton, W.A.H. CONE PIGMENT KINETICS IN THE DEUTERANOPE. J. Physiol., Jan. 1965, 176(1), 38-45. (Physiological Lab., University of Cambridge, Cambridge, England).

Erythrolabe was measured on the fovea of a deuteranope by the method of retinal densitometry and the amount bleached and regenerated in various procedures found. During a 10 sec bleach there is no time for appreciable regeneration and the rate of bleaching was found to be proportional to the rate at which quanta were caught. The rate of regeneration, on the other hand, was proportional to the amount of pigment bleached, the constant being the same for regeneration in the dark or in the light. The 2 results may thus be combined to give the general equation:  $\frac{dp}{dt} = pl \times 10^{-6} - \frac{l-p}{130}$ . The shape and time course of pigment regeneration

is the same as that of the cone dark-adaptation curve. All these results are precisely similar to those of chlorolabe in the protanope. This suggests that erythrolabe and chlorolabe might be one and the same pigment, operating in conjunction with colour selectors etc. In the Discussion that view is rejected.

R 12

27,089

Rushton, W.A.H. STRAY LIGHT AND THE MEASUREMENT OF MIXED PIGMENTS IN THE RETINA. *J. Physiol.*, Jan. 1965, 176(1), 46-55. (Physiological Lab., University of Cambridge, Cambridge, England).

The distribution of light through a mosaic of red cones, green cones, interspaces and general scatter is worked out theoretically and a formula is derived in which the contributions of the 2 types of cone combine by simple addition. Stray light is of 2 kinds. The first, fundal stray light, dilutes the signal from the cones equally at all wave-lengths. This therefore will not distort the difference spectrum but only change its amplitude. Superficial stray light on the other hand dilutes signals far more in the blue than in the red. It therefore changes the shape of the recorded difference spectrum. In order to measure the proportion of superficial stray light the usual optical arrangement was modified so that the retina was illuminated by a ring of light extending 4.3° round the fixation point with a 2.8° dark centre. The amount of light scattered into the pathway from the dark centre was measured for various wave-length with the results that red light was found to be scattered most, and the spectral distribution was very similar to that of reflexion from the fundus. Of all the light returning from the eye into the measuring equipment, 6% on average was scattered to the pathway from the dark centre. This light came partly from superficial scatter and partly from deep penetration and scatter in the sclera. The similarity of its spectral distribution with that of light reflected deep from the fundus points to the predominance of scleral scatter. Thus of the 6% of light that is scattered, only 1% is likely to be superficial.

R 7

27,090

Baker, H.D. & Rushton, W.A.H. THE RED-SENSITIVE PIGMENT IN NORMAL CONES. *J. Physiol.*, Jan. 1965, 176(1), 56-72. (Physiological Lab., University of Cambridge, Cambridge, England).

In order to study the red-sensitive pigment in the normal eye, Ss specially rich in this pigment but with normal colour vision were used. When reflectivity measurements were made at a wave-length of 625 mμ, only 1 pigment was involved and that had the same photosensitivity as erythrolabe in the deuteranope when measured both in deep red and also in blue-green light. In fact the photosensitivity was the same at all wave-lengths and the 2 action spectra coincided. The action spectrum also corresponds to that of Stiles's red mechanism of colour vision  $\pi_2$ . The time course of pigment regeneration after full bleaching coincides with that in the deuteranope and with the normal dark adaptation curve using a deep red test flash.

R 18

27,091

Cornsweet, T.N. & Pinsky, H.M. LUMINANCE DISCRIMINATION OF BRIEF FLASHES UNDER VARIOUS CONDITIONS OF ADAPTATION. *J. Physiol.*, Jan. 1965, 176(2), 294-310. (Psychology Dept., University of California, Berkeley, Calif.).

Human observers were trained to discriminate differences in luminance between 2 simultaneously presented disks of light. The disks were each 50 minutes in diameter, and their centres were 1° above and 1° below a fixation point. After each exposure, the observer was told whether or not he had judged correctly. When the eye was completely dark-adapted before each flash, and the disks were flashed for 4.5 msec, the Weber fraction was found to be constant over a range of luminances from just above the absolute threshold to approximately 5 log units above absolute threshold. Higher luminances were not tested. When the relevant region of the retina was completely light-adapted to the base luminance before each flash, but the adapting field (of the same size as the stimulus) was turned off 5 sec before the disks were flashed for 4.5 msec, the Weber fraction was again found to be constant and at the same value as in above, over the same range of luminances. When the relevant region of the retina was completely light-adapted to the base luminance before each flash, but the flash was presented for 3.6 msec as an increment to 1 of the already lighted disks, the Weber fraction was found to be very large at low base luminances and to decrease to a level close to the levels above at high base luminances. The results of these experiments are discussed in terms of the psychophysical procedures, and the possible role of quantal fluctuations is considered. The suggestion is made that departures from Weber's law may be attributable to changes in the integration time of the visual system.

R 14

27,092

Alpern, M. ROD-CONE INDEPENDENCE IN THE AFTER-FLASH EFFECT. *J. Physiol.*, Feb. 1965, 176(3), 462-472. (University of Michigan, Ann Arbor, Mich.).

The threshold for a 5 msec flash can be greatly raised by following it (50 msec later) by a 5 msec after-flash applied to the surround. When the test flash excites only rods, after-flashes of various wave-lengths but of fixed scotopic brightness all raise the test threshold equally. Thus it is the excitation only of the rods by the after-flash that raises the rod threshold of the test flash. During the period of dark adaptation, when the cones have fully recovered but the rod threshold still lies above them, a similar effect of the after-flash in raising the test threshold may be seen. Since in this case neither flash falls upon an active rod mechanism, the phenomenon demonstrates that cones affect cones as much as rods affect rods. This conclusion is confirmed by experiments in which the test flash enters through the centre, and the after-flash through either the centre or the edge, of the widely dilated pupil (Stiles-Crawford effect). There was no interaction between rods and cones.

R 10

27,093

Alpern, M. & Rushton, W.A.H. THE SPECIFICITY OF THE CONE INTERACTION IN THE AFTER-FLASH EFFECT. *J. Physiol.*, Feb. 1965, 176(3), 473-482. (University of Michigan, Ann Arbor, Mich. & Physiological Lab., University of Cambridge, Cambridge, England).

The threshold for a foveal fixated 1° test flash can be appreciably elevated by exposing to the surrounding field a brief flash 50 msec later. The size of the effect depends upon the intensity and dominant wave-length of the after-flash and the dominant wave-length of the test flash. Each of the Stiles's colour mechanisms act independently in these after-flash experiments. If the test flash at threshold excites  $\pi_5$ , then the after-flash raises this threshold only by stimulating  $\pi_5$  in the surround. The extent to which  $\pi_4$  or  $\pi_1$  are also stimulated is quite irrelevant. Similarly if the test excites  $\pi_4$  or  $\pi_1$  at threshold, the after-flash effectiveness depends solely upon the stimulation of  $\pi_4$  or  $\pi_1$  in the surround.

R 7

27,094

Rushton, W.A.H. THE SENSITIVITY OF RODS UNDER ILLUMINATION. *J. Physiol.*, May 1965, 178(1), 141-160. (Physiological Lab., University of Cambridge, Cambridge, England).

It is a familiar fact that if a fixed flash is projected upon a background that becomes brighter and brighter, the flash will appear fainter and finally become invisible. This paper investigates for rod vision what it is that becomes insensitive to the fixed flash. Does rhodopsin catch fewer quanta, or is a greater catch needed to generate a rod signal or are more signals required for vision? It was found that a background that raised 3-fold the threshold of a superimposed flash was still so weak that not 1% of the rods caught 1 quantum from it. Obviously this 1% that 'saw' the background must somehow have raised the threshold of the 99% that did not. It is concluded that a rod generates a signal whenever it catches a quantum, and the near coincidence of  $n$  signals arriving at the summation pool is the criterion for seeing. The value of  $n$ , however, is not fixed but depends upon the flux of signals to the pool. This view was supported by having as background a black-red grating whose bars subtended  $0.25^\circ$ , and as test flash a black-green grating of the same period. The flash could be presented in-phase (bright bar on bright bar) or out-of-phase (bright bar on dark bar). It was found that the threshold was the same in either position, both in experiments with voluntary fixation and in those with a stabilized image. It follows that the rod threshold does not depend upon a) the total flux of signals to the pool from the background for that determines the magnitude of  $n$ ; and b) the total flux from the test for that determines whether  $n$  has been reached. But in all these experiments the pool appears quite indifferent to the provenance of its signals.

R 29

27,095

Cunningham, D.J.C., Elliott, D.H., Lloyd, B.B., Miller, J.P. et al. A COMPARISON OF THE EFFECTS OF OSCILLATING AND STEADY ALVEOLAR PARTIAL PRESSURES OF OXYGEN AND CARBON DIOXIDE ON THE PULMONARY VENTILATION. *J. Physiol.*, Aug. 1965, 179(3), 498-508. (Physiology Lab., University of Oxford, Oxford, England).

We have examined the effect on pulmonary ventilation in 3 resting normal human Ss of induced breath-by-breath oscillations in  $P_A\text{CO}_2$ , in  $P_A\text{O}_2$  or both simultaneously. The experiments were done against a background of substantial hyperpnoea induced by hypercapnia and moderate hypoxia. Since ventilation was high, breath-by-breath alternation of inspired mixtures produced large and rapid changes of alveolar partial pressures. During the oscillations  $M P_A\text{CO}_2$  and  $P_A\text{O}_2$  were determined by slow end-tidal sampling. The ventilations observed during the oscillations of  $P_A\text{CO}_2$  and  $P_A\text{O}_2$  were compared with the  $\dot{V}$  predicted for the observed  $M P_A\text{CO}_2$  and  $P_A\text{O}_2$  from the measured steady-state  $\dot{V}$ ,  $P_A\text{CO}_2$ ,  $P_A\text{O}_2$  relation. No systematic differences were found. The results are discussed in relation to current reports in the literature of the efficacy of oscillating signals in stimulating ventilation.

R 28

27,096

Brindley, G.S. & Westheimer, G. THE SPATIAL PROPERTIES OF THE HUMAN ELECTRORETINOGRAM. *J. Physiol.*, Aug. 1965, 179(3), 518-537. (Neurosensory Lab., University of California, Berkeley, Calif.).

A technique has been developed for recording the electroretinogram of any small region of the human retina. Responses to stray light are suppressed by steady illumination of the whole retina outside the geometrical image of the stimulus. The technique is easily capable of detecting the blind spot, and of examining the electrical response to a stimulus of  $2^\circ$  diameter centred on the fixation point. For stimuli larger than several square degrees, the electroretinogram shows exact spatial additivity. On a finer scale it is at least roughly additive. The foveal electroretinogram differs in shape from the extrafoveal. The electroretinograms of different regions of the extrafoveal retina differ greatly from another in their amplitude per unit area of retina, but little if at all in their shape.

R 12

27,097

Robinson, D.A. THE MECHANICS OF HUMAN SMOOTH PURSUIT EYE MOVEMENT. *J. Physiol.*, Oct. 1965, 180(3), 569-591. (Medicine Dept., Johns Hopkins University, Baltimore, Md.).

Eye movements and net isometric tension in the horizontal recti were measured in humans tracking visual targets moving in an unpredictable fashion but in a manner to elicit smooth pursuit eye movements. The following results were obtained. The time required for the eye to accelerate from rest to any velocity from 5 to 20 deg/sec is about 130 msec. The same static and dynamic relation between net active-state tension and globe rotation exists for both saccadic and smooth pursuit movements. The smooth pursuit system exhibits non-linearity in that larger velocity changes are met with proportionately less excess rate of rise of muscle tension, take slightly longer to be accomplished and exhibit less or no velocity overshoot. Smooth pursuit and saccadic movements may occur with complete temporal independence. Smooth movements may occur just before, after or with saccades. In the latter case, non-linear interaction in the form of augmentation produces discrete changes in smooth pursuit velocity. The smooth pursuit system is capable of individual responses to 2 target motions spaced 75 msec apart. This is taken as evidence that the smooth pursuit system is a continuous as opposed to a sampled system. Under conditions of visual feedback, the smooth pursuit system is shown to be capable of smooth endless pursuit under positive feedback and sinusoidal oscillation (at 3.3 c/s) under negative feedback after the fashion of continuous control systems.

R 14

27,098

Marriott, F.H.C. THRESHOLDS FOR NEGATIVE AFTER-IMAGES. *J. Physiol.*, Oct. 1965, 180(4), 888-892. (Physiology Lab., University of Oxford, England).

After-images produced by black and light targets  $4^\circ$  in diameter in peripheral vision with very low illumination are described. The thresholds for the appearance of these after-images were measured and found to be almost the same as the thresholds for detection of the targets. These after-images are ascribed to neural effects and associated with reactions described in electrophysiological experiments on the mammalian eye.

R 12

27,099

Harding, P.E., Roman, D. & Whelan, R.F. DIVING BRADY-CARDIA IN MAN. *J. Physiol.*, Nov. 1965, 181(2), 401-409. (Human Physiology & Pharmacology Dept., University of Adelaide, Adelaide, Australia).

The heart rates and arterial blood pressures of adult male Ss were measured in the upright position before, during and after a 45 sec voluntary apnoea, performed both in air and while fully immersed in water. Holding the breath in air caused a fall in blood pressure resembling the response the Valsalva manoeuvre, and a tachycardia. The response was reversed when the breath was held when immersed; the blood pressure rose and a bradycardia occurred. No difference was found between those accustomed and those unaccustomed to skin diving.

R 9

27,100

Campbell, F.W. & Green, D.G. OPTICAL AND RETINAL FACTORS AFFECTING VISUAL RESOLUTION. *J. Physiol.*, Dec. 1965, 181(3), 576-593. (Physiological Lab., University of Cambridge, Cambridge, England).

With a neon-helium laser as a light source, interference fringes were produced on the retina directly, thus by-passing the effects of the optics of the eye. Threshold contrasts for resolution of these interference fringes were measured. It was found that the contrast sensitivity decreased roughly exponentially with increase in spatial frequency. The contrast sensitivity of the over-all visual system was measured with similar sinusoidal gratings displayed on an oscilloscope. At all spatial frequencies the contrast sensitivity was found to be lower than that obtained with the interference fringes. By finding the ratio between the contrast sensitivities measured by these 2 techniques, the contrast reduction due to the optics of the eye was calculated. The effects of changes in pupil size and focus on the quality of the retinal image was determined. For an eye with a 2 mm diameter pupil the measured optical attenuation agrees with that predicted for a diffraction-limited system. With increasing pupil size the performance of the optics deviated progressively from a perfect optical system. These results establish that the quality of the optics is substantially better than that determined by recent ophthalmoscopic methods.

R 16

27,101

Blakemore, C.B. & Rushton, W.A.H. DARK ADAPTATION AND INCREMENT THRESHOLD IN A ROD MONOCHROMAT. *J. Physiol.*, Dec. 1965, 181(3), 612-628. (Physiological Lab., University of Cambridge, Cambridge, England).

Threshold measurements were made by a rod monochromat (C.B.B.) in various states of adaptation using various criteria for threshold. The criteria used were either the detection of 1 sec flashes subtending an angle that ranged between 6" & 5', or the resolution of gratings of various pitches. The conditions of adaptation were either dark adaptation following exposure to a bright light that bleached about 50% of the rhodopsin, or increment threshold where the test flash fell upon a background of variable luminance. For any particular test flash used, it was possible to find the background that raised the threshold to the same value that it had at any given moment of dark adaptation. In this way a dark adaptation curve could be plotted not as log threshold against time but as log equivalent background against time. The dark adaptation curve plotted as log threshold against time has a shape that depends greatly upon the kind of test flash used, and therefore cannot represent directly the regeneration of rhodopsin. When plotted as log equivalent background against time the shape is the same no matter what kind of test is used. This, then, is the excitability measurement that related directly to the amount of rhodopsin bleaches. This confirms the conclusions of Crawford (1947), and extends them as follows: a) we bleached 50% of the rhodopsin; Crawford only bleached 0.2%; b) our subject (C.B.B.) had no cones and the rod threshold was studied over a range of 6 log units; c) we used as threshold criteria, in addition to the detection of lights, the resolution of gratings. Despite this increase in the range of investigation Crawford's principle of "equivalent backgrounds" remained valid.

R 35

27,102

Blakemore, C.B. & Rushton, W.A.H. THE ROD INCREMENT THRESHOLD DURING DARK ADAPTATION IN NORMAL AND ROD MONOCHROMAT. *J. Physiol.*, Dec. 1965, 181(3), 629-640. (Physiological Lab., University of Cambridge, Cambridge, England).

In the previous paper (Blakemore & Rushton, 1965) (HEIAS 27,101) it was shown that bleaching and backgrounds raised the threshold in similar fashion no matter by what criteria the thresholds were judged. For any state of bleaching there was a certain "equivalent background" that could be measured in trolands. In this paper we ask "if after bleaching, the test flash falls upon a luminous background so that both equivalent and real backgrounds are present, in what way do they combine to define the resulting threshold?" This was investigated on the rod-monochromat over a millionfold range of rod thresholds. It was found that, independent of the criterion of threshold used, equivalent and real backgrounds added together, and the observed threshold was the increment threshold to a real background equal to that sum. The most sensitive observation in testing the additivity of real and equivalent backgrounds is when they contribute in equal parts to the total background. This was tested in the normal eye by a special arrangement. During dark adaptation, as the equivalent background decreased, the real background was also decreased so that the 2 remained equal. The threshold throughout had the value corresponding to the sum of these equal real and equivalent backgrounds.

R 8

27,103

Rushton, W.A.H. THE ROD DARK ADAPTATION CURVE MEASURED ABOVE CONE THRESHOLD. *J. Physiol.*, Dec. 1965, 181(3), 641-644. (Physiological Lab., University of Cambridge, Cambridge, England).

An increment threshold curve obtained with a green flash on a red background is due mainly to rods. The same repeated within 5 min of strong bleaching is due only to cones, and if measurements are made from right to left the curve is nearly that of full cone dark adaptation. Green-on-red incremental stimuli that lie below the threshold for resting cones but above that for resting rods are first seen at instants between 5 & 9 min. from the beginning of dark adaptation. From the magnitude of each such stimulus it is possible to infer the rod threshold at the instant when it is first seen, even though this threshold is above the absolute threshold for cones.

R 4

27,104

Rushton, W.A.H. BLEACHED RHODOPSIN AND VISUAL ADAPTATION. *J. Physiol.*, Dec. 1965, 181(3), 645-655. (Physiological Lab., University of Cambridge, Cambridge, England).

The relation between the bleaching of rhodopsin and the rise in rod threshold is reviewed. Bleaching an area affects adaptation as though a luminous background covered the area. Bleaching an area leaves an after-image that Barlow & Sparrock (1964) have shown has actually the brightness of the "equivalent background". Are bleached rods then sending signals similar to those in response to a luminous background? This attractive idea is shown to be quite wrong by using a background consisting of an array of luminous points, and comparing the spatial interaction when this background is an after-image or external light. With real backgrounds the rise in log threshold is the log of the average background; with after-images it is average of the logs--a very different thing.

R 15

27,105

Westheimer, G. SPATIAL INTERACTION IN THE HUMAN RETINA DURING SCOTOPIC VISION. *J. Physiol.*, Dec. 1965, 181(4), 881-894. (Neurosensory Lab., University of California, Berkeley, Calif.).

The influence of various sizes and brightnesses of background on the sensitivity of scotopic vision was assessed by observing their effects on increment threshold for a small brief extrafoveal test flash. Light falling on or near the retinal area tested elevates the increment threshold. Additional light falling outside a zone about  $3/4^\circ$  in diameter centred on the test flash lowers the increment threshold, but this lowering cannot be demonstrated until the threshold has been raised to a certain level by illumination of the central zone. The observations were confirmed by an experiment in which the size and retinal illuminance of the background were varied so as to keep the increment threshold constant.

R 20

27,106

Leslie, J.M. EFFECTS OF TIME DELAY IN THE VISUAL FEEDBACK LOOP OF A MAN-MACHINE SYSTEM. M.E. Thesis to the Department of Mechanical Engineering, Stanford University. Grant Nsg 111 61, Dec. 1965, 112pp. Stanford University, Stanford, Calif.

This Thesis was aimed at studying the effects of time delay in the visual feedback loop of a man-machine system. A one-dimensional, step-type input, pursuit tracking experiment was developed to study these effects with transmission-type delays of zero to 10 secs. 36 Ss participated in a series of tests that covered: 7 different delays, 2 different levels of course complexity for each delay, learning, and open-loop conditions. It was found that tracking performance deteriorates non-linearly with increases in delay and that the magnitude of this performance degradation is a function of course complexity. The system cutoff frequency ( $f_{co}$ ) can be approximated by  $f_{co}=0.14/T^{0.7}$  for all delays (T) which are much greater than the operator reaction time and for all course complexities studied. A quasi-linear model for system performance was developed.

R 77

27,107

Chapanis, A. ON THE ALLOCATION OF FUNCTIONS BETWEEN MEN AND MACHINES. *Occup. Psychol.*, Jan. 1965, 39(1), 1-11. (Psychology Dept., Johns Hopkins University, Baltimore, Md.).

This paper is a general discussion of the allocation of functions between man and machines. The problem of allocation of function is spelled out and followed by a review of earlier concepts of the problem, including weaknesses and misconceptions. Another section deals with current views on the division of functions between men and machines. A final section outlines a strategy for making allocation decisions involving a) the preparation of a complete and detailed system specification; b) the analysis and listing of system functions; c) the making of tentative assignments for each function; and d) the evaluation of the sum total of functions which have been assigned to man. (HEIAS)

R 17

27,108

Shepard, R.D. "...ALL EXCEPT..." DEFINITION BY EXCLUSION, RELATIVE CLASS COMPLEXITY AND S-R COMPATIBILITY IN DICHOTOMOUS CLASSIFICATION TASKS. *Occup. Psychol.*, July 1965, 39(3), 191-203. (Industrial Psychology Research Unit, MRC, University College, London, England).

The first experiment showed that the economy gained by defining the more complex class in terms of the less complex, while obviously useful in conveying and storing information, had an adverse effect on performance when used in an instruction for 1 kind of classification task, except when the ratio of the class complexities departed markedly from unity. The difficulties associated with definition by exclusion in the instruction appear to arise from greater uncertainty about which items to respond to, since these are defined indirectly, and from higher S-R incompatibility, since the S must respond to items he is not searching for and not respond to those he is searching for. Some indirect support for the reality of the latter source of difficulty was cited from a second experiment which showed that Ss could make an accepting response to the class they were searching for, and a rejecting response to the class they were not searching for, more rapidly than the converse, at least to begin with.

R 9

27,109

Cass-Beggs, Rosemary & Emery, F.E. FOOD, DRINKS AND SWEETS IN THE REDUCTION OF INDUSTRIAL FATIGUE. *Occup. Psychol.*, Oct. 1965, 39(4), 247-259. (Tavistock Institute of Human Relations, London, England).

This paper is organized under the following topic headings: Introduction: fatigue, efficiency and suffering; The Causes of Fatigue; Strategies for Minimizing Fatigue Distress; Food, Drinks and Sweets in Reducing the Level of Non-optimal Stimulation; The British Dietary Pattern and its Implications for Fatigue; The Role of Food, Drinks and Sweets in Raising the Threshold to Feelings of Fatigue Distress; Use of Food, Drinks and Sweets to Mask Fatigue Distress; Individual Variations in Fatigue. The authors conclude that: in addition to the 3 main meals which give a reasonable nutritional standard in the British cultural framework, workers are likely to perform better if they have facilities for getting drinks, such as tea or coffee, and snacks or sweets in-between-times at those intervals when they as individuals need this 'lift'. That is to say, so far as refreshments are concerned, it can benefit production if each worker is able to regenerate energies in accordance with the requirements of his or her particular 'fatigue curve.'

R 33

27,110

Corlett, E.N. A STUDY OF THE ABILITY OF EXPERIENCED AND NAIVE SUBJECTS TO RECOGNISE A CHANGE IN THE RATE OF MOVEMENT OF A LEVER. Occup. Psychol., Oct. 1965, 39(4), 289-300. (Engineering Production Dept., University of Birmingham, Birmingham, England).

The paper reports experiments on skilled drilling operators and Ss with no drilling experience to find their ability to recognise a change in the rate of descent of a drilling machine hand feed lever. The success of each group at the task was the same but the response times, pressures exerted on the lever and guessing patterns were very different. The main conclusions from this experiment may be summarised as: a) The degree of success between the 2 groups was much the same; b) The "skilled" group guessed very much more than the "unskilled" group; c) Rate of movement was the most probable stimulus for recognising the change point; d) A high degree of success cannot be obtained with a widely varying applied pressure, suggesting that a steady rate of movement of the drill handle is required; e) The big differences between the 2 groups with respect to the tendency to guess and the effect of the starting position suggests that the use of a "personality" test may indicate some reasons for these differences.

R 9

27,111

Damon, A. & Crichton, J.M. BODY DISPROPORTIONS AND OCCUPATIONAL SUCCESS IN BUS AND TRUCK DRIVERS. Amer. J. phys. Anthropol., March 1965, 23(1), 63-68. (Anthropology Dept., Harvard University, Cambridge, Mass.).

10 indices of body proportion were compared among 43-103 champion and 200-268 regular truck drivers. Significant differences were found in the M values for 3 indices--biacromial diameter/chest circumference, chest depth/biacromial, and calf circumference/biacromial--but in only 1 disproportion percentage (percentage of the group beyond 1 SD from the champions' M)--namely, chest depth/biacromial. Differences in M values were attributable mainly to the champions' larger biacromial breadth. Previous reports that superior performers within an occupational group had fewer disproportions than average performers were not confirmed.

R 7

27,112

Damon, A. NOTES ON ANTHROPOMETRIC TECHNIQUE. II. SKINFOLDS--RIGHT AND LEFT SIDES; HELD BY ONE OR TWO HANDS. Amer. J. phys. Anthropol., Sept. 1965, 23(3), 305-306. (Epidemiology Dept., Harvard School of Public Health, Boston, Mass.).

This note discusses the 2 technical questions: the difference between skinfolds measured on the left side of the body as in Britain, and the right side as in the U.S.; and the difference between skinfolds lifted with one vs. 2 hands. In a longitudinal aging study of healthy white male veterans 25-65 yrs, these observations were made. Correlation coefficients also were computed at each site, triceps, and subscapular, between skinfold size and the amount of difference between the 2 sides or between the 2 methods of lifting skinfolds. It was concluded that skinfolds should be lifted between 2 hands and measured on the left side. So much work has been based on the right side and one-handed pinch, however, that this body of data outweighs the slight advantage to be gained by modifying current practice. Either side and 1 or 2 hands may be used if the technique is specified and takes possible discrepancies into account.

R 2

27,113

Damon, A. NOTES ON ANTHROPOMETRIC TECHNIQUE. III. ADULT WEIGHT GAIN, ACCURACY OF STATED WEIGHT, AND THEIR IMPLICATIONS FOR CONSTITUTIONAL ANTHROPOLOGY. Amer. J. phys. Anthropol., Sept. 1965, 23(3), 306-311. (Anthropology Dept., Harvard University, Cambridge, Mass.).

Recent cross-sectional and longitudinal studies show that American men gain at least 14-17 pounds, on the average, beyond their late teens or early 20's. The amount of gain is masked in cross-sectional studies, which show mean differences of 12-13 pounds, by the secular trend toward larger size. Cross-sectional studies also show a weight "loss" beyond age 50 not borne out longitudinally. Some primitive groups show no adult weight gain. The extent of varying individual weight gain poses a problem in constitutional anthropology. If a constant physical characteristic is sought, rating standards will differ at different ages. If phenotypic description is the aim, many persons will receive different ratings at different ages. Correlation coefficients between somatotype components from one age to another have varied between 0.43 and 0.70 over a wide range of ages (7-11, 10-18, and 23-46 years). Among 273 white and 49 Negro soldiers averaging 25 years of age, the discrepancy between stated and measured nude weight was 5.8 pounds (absolute mean, disregarding sign). 42% of the soldiers' estimates deviated by 5 pounds or more, 19% by 10 pounds or more. Heavy men underestimated their weight, light ones overestimated theirs. It was concluded that age-ponderal index tables for somatotyping, whether based on stated, recalled, or measured weights, should be regarded as guides to rating rather than as strict determinants.

R 26

27,114

Schultz, D.P. THEORIES OF PANIC BEHAVIOR: A REVIEW. J. soc. Psychol., June 1965, 66(First Half), 31-40. (Psychology Dept., Mary Washington College, University of Virginia, Fredericksburg, Va.).

As a prelude to a research program designed to investigate the role of certain variables in facilitating or minimizing panic behavior, the author reviews various theoretical formulations that attempt to explain this phenomenon of social disorganization. Panic in organized groups, such as the military is differentiated from than in unorganized groups. (HEIAS)

R 17

27,115

Palmer, G.J., Jr. & Sells, S.B. BEHAVIORAL FACTORS IN DISASTER SITUATIONS. J. soc. Psychol., June 1965, 66(First Half), 65-71. (Behavioral Research Institute, Texas Christian University, Fort Worth, Tex.).

The present paper attempts to analyze some of the problems of civil defense planning for possible nuclear attack. The emphasis is largely on postnuclear attack phenomena, but the critical importance of pre-attack warning and preparation is stressed. (HEIAS)

R 15



27,116

Reynolds, D. & Toch, H.H. PERCEPTUAL CORRELATES OF PREJUDICE: A STEREOSCOPIC-CONSTANCY EXPERIMENT. *J. soc. Psychol.*, June 1965, 66(First Half), 127-133. (Psychology Dept., Michigan State University, East Lansing, Mich.).

In the 2 studies reported, a hypothesized relationship between attitudes toward Negroes and a stereoscopic interracial-constancy effect is examined. There were no statistically significant differences between the high-prejudice and low-prejudice groups in their readiness to perceive Caucasian and Negro faces. Trends observed in the data support previous findings that Ss high in prejudice tend to report more binocular rivalry and less binocular fusion when the stimulus material consists of biracial stereograms than do low-prejudiced Ss. Because the constancy phenomenon evoked by the method of stimulus presentation works against the likelihood of reports of rivalry or fusion, the trends may assume greater proportions than one would otherwise assign to them.

T 7

27,117

Gunderson, E.K.E. & Nelson, P.D. MEASUREMENT OF GROUP EFFECTIVENESS IN NATURAL ISOLATED GROUPS. *J. soc. Psychol.*, Aug. 1965, 66(Second Half), 241-249. (USN Medical Neuropsychiatric Research Unit, Bureau of Medicine & Surgery, San Diego, Calif.).

The systematic study of interpersonal relations and productivity in natural isolated groups requires measurement techniques that are practicable for administration in groups operating under variable or extreme environmental conditions. In the present study, simple questionnaire scales designed to measure group cooperation and effectiveness demonstrated acceptable reliability and were shown to relate consistently to an independent criterion of group effectiveness. Significant changes in social relations and group accomplishment were recorded in several of the Antarctic groups studied. Maintenance of group organization, harmony, and efficiency under conditions of long-term isolation and confinement, such as exist at Antarctic stations, appears to be a very difficult but not an impossible task.

R 3

27,118

Hudson, B.B., McDavid, J. & Binner, Marian R. GROUP RESPONSES TO THREAT: PERCEPTION AND LEARNING UNDER STRESS. *J. soc. Psychol.*, Oct. 1965, 67(First Half), 115-137. (Psychology Dept., Rice University, Houston, Tex.).

In 1 series of studies intermittent sounds of fire equipment and aircraft were presented to captive audiences over 25 min. periods. The data obtained were derived from moving-picture and 0 records made during the experiment and from interviews and questionnaires following. The common interpretations made in these instances were war, threat of war, fire, and accident. Anxiety was typical, a response which was correlated with a number of other measures: with perception (projection) of anxiety in the group as a whole ( $p < .01$ ); with suggestibility ( $p < .10$ ), with "scapegoating" ( $p < .05$ ), and with failure in retention ( $p < .01$ ). A covert pattern of responses that always occurs on exposure to ambiguous events is the formulation of hypotheses in attempts at recognition. These are rapid associative processes often involving remote and seemingly irrelevant experiences. Anxiety was correlated with their degree of confusion ( $p < .01$ ), but not necessarily with the seriousness of the inferred threat. In the experiments cited, different methods were employed in efforts to relieve anxiety: e.g., prayer and humor. Mild anxiety was aroused in some Ss by sounds of fire trucks and aircraft for several days after the experiments, responses which were related to the amount of anxiety aroused during the experiment ( $p < .05$ ).

R 28

27,119

Hartley, R.E. PERCEPTUAL ACCENTUATION AS A PROBLEM IN THE PSYCHOLOGY OF JUDGMENT. *J. soc. Psychol.*, Oct. 1965, 67(First Half), 149-162. (Psychology Dept., University of Miami, Coral Gables, Fla.).

It is argued that the experimental paradigm for perceptual-accentuation studies should be 1 of psychophysical scaling in which the objects involved are scaled on a variable, scaled again on the same dimension when the judgments were made in the presence of a disturber, and the disturber variable itself scaled. The disturber variable is ordinarily value, but need not be. The object is to discover the function relating the 3 sets of scale values. In the present study the scale values gotten in the presence of the disturber variable were found to be a linear transformation of the scale values gotten in the absence of the disturber variable plus an increment which is a function of the extremeness of the object in terms of the scale values on the disturber variable. A hypothesis explaining these results in terms of a discrimination process is offered.

R 4

27,120

Dabbs, J.M., Jr. & Janis, I.L. WHY DOES EATING WHILE READING FACILITATE OPINION CHANGE?--AN EXPERIMENTAL INQUIRY. *J. exp. Soc. Psychol.*, July 1965, 1(2), 133-144. (Yale University, New Haven, Conn.).

The purpose of this experiment was to follow up on previous findings of a gain in opinion change produced by eating-while-reading by testing predictions from a "conditioning" theory and from an alternative explanation in terms of greater receptivity to any communication endorsed by E, the donor of the food. A factorial design was used to determine the extent to which the opinion changes induced by 2 persuasive communications were influenced by a) E's giving food contiguously with exposure to the communications vs. giving the food beforehand, and b) E's positive vs. negative endorsement of the conclusions advocated by the communication. An analysis of variance of the opinion-change scores showed that neither variable had a significant main effect but there was a significant interaction effect: Positive endorsement of the communications by E was highly influential when he gave food contiguously with the communications but not when he gave food beforehand. The following "momentary compliance" hypothesis was inferred from the findings: The consumption of proffered food induces a momentary mood of compliance toward the donor that is strongest at the time the food is being consumed and that decreases in strength rapidly after the food has been consumed.

R 2

27,121

USAF Aerospace Medical Research Laboratories. PROCEEDINGS OF THE CONFERENCE ON ATMOSPHERIC CONTAMINATION IN CONFINED SPACE. 30 MARCH- 1 APRIL 1965. Contract AF 33(657) 11305, Proj. 6302, AMRL TR 65 230, Dec. 1965, 317pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

This report is a complete compilation of the papers presented and the proceedings of the Conference on Atmospheric Contamination in Confined Spaces, sponsored by the Aerospace Medical Research Laboratories and held in Dayton, Ohio on 30, 31 March and 1 April 1965. Major technical areas discussed by the invited speakers, panel members and Conference attendees included continuous inhalation exposure techniques, statistical methods for evaluation and interpretation of exposure data, minimum criteria for continuous exposure studies and toxicological qualification of space cabin materials. The Conference participants were provided the opportunity to tour the Toxic Hazards Research Unit at Wright-Patterson Air Force Base and to ask questions regarding its operation. A discussion of the Clean Air Act of 1963 was presented by a representative of the Federal Department of Health, Education and Welfare.

R many

27,122

Rubioff, M. & White, J.F., Jr. DESCRIPTION OF CATALOGING AND INDEXING SYSTEM FOR THE ACM REPOSITORY. Contract AF 49(638) 1421, AFOSR 65 0424, Jan. 1965, 60pp. Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Penn. (AD 612277)

Implementation of an information storage and retrieval system has been initiated for the ACM Repository along with companion activities at The Moore School of Electrical Engineering. Since this has been done in anticipation of mechanization, the capabilities and limitations of machines have been taken into account. The installation immediately in view includes as principle features a teletypewriter serving as remote console with direct access to the central processing unit of an IBM 7040/1301 system otherwise configured mostly for batch processing operations. In the exposition in this manual, reference to "documents" is intended to be applicable to a wide class of information-bearing media as long as it tends to be permanent in form. The subject matter of the documents in the Repository emphasizes computing machinery and programming languages, in accordance with the policy of the Association for Computing Machinery. The central feature of the Repository system is a Main Catalog. Secondly, there are inverted lists which serve as indexes, and which (selectively) are constructed as terminal digit posting cards amenable to manual operation. Documents are identified or given names for use in the system by means of accession numbers, which, when posted in the inverted lists are sometimes embellished to show under what conditions the documents are related to the index term. Thirdly, there is a pseudo-thesaurus and other related tools of similar nature, all of which are given thesaurus-like treatment.

R 17

27,123

Hammer, C.H. TIMELINESS AND ACCURACY IN A SEQUENTIAL DECISION MAKING TASK. DA Proj. R&D 2J024701A723, Tech. Res. Note 162, Oct. 1965, 34pp. USA Personnel Research Office, Support Systems Research Lab., OCRD, Washington, D.C. (AD 625223)

1 objective of the COMMAND SYSTEMS Task is to provide research information by which decision making and information assimilation from displays may be facilitated. The present publication reports on an experiment conducted to investigate the amount of intelligence information which decision makers judge sufficient for action and to relate these judgments to the accuracy and timeliness of the decisions made. In a series of simulated military situations involving threat evaluation, 3 practice problems and 9 experimental problems were generated. Slides showing 4, 6, or 8 successive aggressor force moves toward 3 friendly units were shown to 60 enlisted men each of whom was required to give an interim judgment as well as a final decision as to enemy attack intent. Analysis of results showed large individual differences in judgments of confidence and sufficiency. Tendency to judge information insufficient for taking action was significantly greater when lesser amounts of information were provided. For final decisions, as more information was provided, accuracy of performance increased from 46% to 81% and judgments of confidence increased from 52% to 68%. Findings strongly suggest that along with techniques to enhance the accuracy of decisions, effective techniques are needed to enhance confidence in those decisions thereby increasing timeliness with which accurate decisions are reached.

R 6

27,124

Almond, J.A. PERSONAL TELEMETRY TRANSMITTER SYSTEM. FINAL REPORT JANUARY 1964-MARCH 1965. Contract AF 33(615) 1194, Proj. 7222, AMRL TR 65 87, June 1965, 24pp. USAF Biophysics Lab., Wright-Patterson AFB, Ohio. (Repro Incorporated, Orlando, Fla.).

The research and development described in this report resulted in the redesign and miniaturization of a Personal Telemetry Transmitter System originally developed by AMRL. The Personal Telemetry Transmitter System transmits 7 channels of physiological data on the commercial FM band to a receiver located up to 200 feet away. The 7 channels transmitted by pulse duration modulation are EEG, 2 leads of ECG, GSR (base resistance and specific response), respiration, and body temperature. Extremely compact packaging combined with miniature components resulted in a package size of 4.28 by 2.19 by .81 in. for a total volume of 7.6 cu. in. including the battery.

R 1

27,125

Dickmann, R.A. PERSONNEL INVENTORY (A REPORT ON AN AUTOMATED INDEX TO MANPOWER). Contract N0w 62 0604c, TG 647, Jan. 1965, 22pp. Applied Physics Lab., Johns Hopkins University, Silver Spring, Md. (AD 462334)

The purpose and problems of an automated index to manpower are presented and 4 criteria for the elimination of these problems are listed. An explanation of ALGONE, APL's personnel inventory program, is given outlining in some detail the application of ALGONE to the search, print, and edit functions of APL's Information Storage Package. Finally, ALGONE's present value and future potentialities are given.

27,126

Drissel, W.E., Haines, R.L., Kell, R.J., Lovinger, D.N., et al. STUDY OF AN ATTITUDE CONTROL SYSTEM FOR THE ASTRONAUT MANEUVERING UNIT. Contract NASw 841, NASA CR 198, March 1965, 287pp. National Aeronautics & Space Administration, Washington, D.C. (Honeywell, Incorporated, Minneapolis, Minn.).

This report describes the work done under a study contract whose objectives were to study Attitude Control Systems (ACS's) for Astronaut Maneuvering Units (AMU's) and to define in detail the most nearly optimum system for the application. Detailed definition included identification or specification of principal components, and specification and drawing layout of all circuitry. The system uses a voice-operated controller for both attitude and translational control, 3 floated integrating gyros for attitude sensing, a fixed pulse and pseudo-rate control system, and 8 reaction jets.

R 61

27,127

Sidorsky, R.C. & Houseman, Joan F. RESEARCH ON GENERALIZED SKILLS RELATED TO TACTICAL DECISION MAKING. Contract N61339 1329, Tech. Rep. NAVTRADEVEN 1329 2, Sept. 1965, 103pp. USN Training Device Center, Port Washington, N.Y. (Electric Boat Div., General Dynamics Corporation, Groton, Conn.).

This report describes the experimental and analytic results of Phase II of a continuing program of research on training aspects of tactical decision making. 2 experiments were carried out. Exp. I was concerned with the effects on decision-making behavior of the time scale, i.e., the period of time over which the critical phase of a tactical situation develops. The decision responses associated with weapon firing under short (AAW) and long (ASW) time scale conditions were recorded. In Exp. II the Ss were required to anticipate the opponent's action in attacking (or defending) one of a pair of targets which varied in tactical value and/or vulnerability to attack. Some implications for decision-making training devices and procedures are discussed. A survey of decision-making literature was conducted and the results of a number of studies by other investigators were evaluated in the context of ACADIA--the taxonomy of tactical decision tasks developed in Phase I.

R 98

27,128

Schum, D.A., Goldstein, I.L. & Southard, J.F. FURTHER INVESTIGATION OF THE EFFECTS OF REDUCED INPUT DATA FIDELITY UPON THE DETERMINATION OF POSTERIOR PROBABILITIES IN A SIMULATED THREAT-DIAGNOSIS SYSTEM. FINAL REPORT, 15 MARCH 1964-1 AUGUST 1964. Contract AF 33(657) 10763, Proj. 7184, Task 718403, AMRL TR 65 233, Dec. 1965, 19pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Human Performance Center, Ohio State University Research Foundation, Columbus, Ohio).

This is the fifth in a series of experiments on Bayesian diagnostic systems. In this experiment 2 procedures for obtaining a posteriori  $[P(H/D)]$  probability estimates were compared under conditions of low fidelity of input data and various levels of time-stress. In one procedure a computer aggregated the Ss' a priori  $[P(D/H)]$  estimates. In the alternate procedure the a posteriori probabilities were estimated by the Ss without computer aid. The results favor the computer-aided procedure and, hence, tend to support the use of automated Bayesian hypothesis-selection procedures in diagnostic systems.

R 6

27,129

Schum, D.A. INFERENCES ON THE BASIS OF CONDITIONALLY NONINDEPENDENT DATA. FINAL REPORT. Contract AF 33(657) 10763, Proj. 7184, Task 718403, AMRL TR 65 161, Dec. 1965, 36pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Aviation Psychology Lab., Ohio State University Research Foundation, Columbus, Ohio).

This experiment was concerned with decision making in a tactical threat situation (simulated). More specifically, it was concerned with the ability of Ss to estimate the likelihood of hypotheses concerning the "adversary's" intentions being true. The data, presented to the Ss concerning the enemy, were internally interrelated in a probabilistic sense. The purpose of the study was to evaluate the Ss' ability to exploit these interrelationships in making their estimates concerning the probable intentions of the enemy. The Ss' likelihood estimates as to the enemy's intent were compared with those computed using Bayes' theorem--a mathematical technique that, theoretically, makes maximum use of the data, their interrelationships and their relation to the hypotheses. In general, the estimates made by well-trained Ss agreed closely with those calculated from Bayes' theorem. The Ss apparently were able to exploit the probabilistic interrelationships in the data. Furthermore, the Ss' estimates reflected neither the conservatism nor the "recklessness" suggested by other previous experiments.

R 6

27,130

Rogers, J.P. & Thorne, H.W. THE DEVELOPMENT AND EVALUATION OF AN IMPROVED ELECTRONICS TROUBLE SHOOTING MANUAL. Contract AD 44 188, ARO 2, DA Proj. 2J024701A712 01, Task MAINTRAIN, Subtask V, Tech. Rep. 65 1, March 1965, 51pp. Human Resources Research Office, George Washington University, Alexandria, Va.

To develop a maintenance manual that would permit a trained technician to troubleshoot electronic equipment faster and more accurately, hypotheses were developed about what information should be presented. An experimental manual was prepared for troubleshooting the Nike Ajax and its test equipment; it contained some information not found in conventional manuals and was organized according to when and how information is to be used. An experimental group using the experimental manual was able to troubleshoot faster and more effectively than a control group using standard schematic and functional diagrams and personal notes. A list of desirable contents for troubleshooting manuals was drawn up, and procedures for preparing troubleshooting manuals were written.

R 12

27,131

Lauringson, A. POSSIBLE UTILIZATION OF THE HUMAN OCULOMOTOR SYSTEM FOR CONTROL PURPOSES. Contract DA 44 009 AMC 930(T), Proj. 4A014501A52C, ERDL T 1788 65, June 1965, 8pp. USA Engineer Research & Development Labs., Fort Belvoir, Va. (John F. Holman Company, Inc., Washington, D.C.). (Transl: Academy of Sciences of the Estonia SSR, Institute of Cybernetics, 1964, 2, 121-126). (AD 616527)

The relative efficiency and adaptation of the human operator and oculomotor systems as tracking systems of moving objects are discussed. The oculomotor was found to be more effective. Its substitution for the "operator" system type of tracking system is therefore considered quite feasible.

R 12

27,132

Lane, N.E. CORRELATIONAL ANALYSIS OF QUALITATIVE DATA. BuMed Proj. MR005.13 3003, Subtask 1, NSAM 925, Rep. 42, May 1965, 7pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

The development of computers has made possible the analysis of the complex interrelationships of relatively large numbers of variables. In order to use regression or multiple correlation techniques, the data from these variables must be meaningfully quantified. The raw data in medical and biological studies, however, are often expressed as categories (such as diagnoses) or in purely qualitative form (such as the presence or absence of a symptom). This paper describes a method of converting such categorical or qualitative data into a series of so-called "pseudovariables," which permits their inclusion in correlational analysis and prediction studies. Examples illustrate the method as it might be applied to a study of the relationships of occupation and cholesterol level. Extensions of the technique and additional applications are suggested.

R 7

27,133

Eisenberger, I. TESTS OF HYPOTHESES AND ESTIMATION OF THE CORRELATION COEFFICIENT USING QUANTILES, II. Contract NAS 7 100, JPL Tech. Rep. 32 755, Sept. 1965, 32pp. Jet Propulsion Lab., California Institute of Technology, Pasadena, Calif.

Further results are presented of the investigation into the use of quantiles in data compression of space telemetry. Tests of hypotheses are given using 1, 2, & 4 optimum sample quantiles. In Test A, one decides whether the M of a normal population has a value of  $\mu_1$  or a value of  $\mu_2$  when the variance is unknown. Test B decides whether the unknown means of 2 normal populations are identical when the common variance is unknown. Test C decides whether the unknown variances of 2 normal populations are identical when the common M and variance are unknown. Test D decides whether or not 2 normal populations are independent when their common M and variance are unknown. In addition, estimators of the correlation coefficient are constructed. Sub-optimum test statistics and estimators using the same 4 quantiles are also given. In all cases, the sample sizes are assumed to be large.

R 8

27,134

Eisenberger, I. TESTS OF HYPOTHESES AND ESTIMATION OF THE CORRELATION COEFFICIENT USING QUANTILES, I. Contract NAS 7 100, JPL Tech. Rep. 32 718, June 1965, 57pp. Jet Propulsion Lab., California Institute of Technology, Pasadena, Calif.

This Report presents some of the results of the continuing investigation into the use of sample quantiles for data compression of space telemetry. The first 2 tests are concerned with the value of one of the parameters of a normal distribution when the value of the other is known. The third one tests both parameters simultaneously. The next 2 tests are 2 sample tests; one tests the hypothesis the  $\mu_2 = \mu_1$ , and the other tests the hypothesis that  $\sigma_2 = \sigma_1$ . Finally, pairs of sample values are tested for independence and, in addition, estimators of the correlation coefficient are given. The tests and estimators are all based on sample quantiles, and the sample sizes are assumed to be large.

R 10

27,135

Batteau, D.W., Plante, R.L., Spencer, R.H. & Lyle, W.E. LOCALIZATION OF SOUND, PART 5. AUDITORY PERCEPTION. Contract N123 (60530) 35401A, NTS TP 3109, Jan. 1965, 80pp. USN Ordnance Test Station, Bureau of Naval Weapons, China Lake, Calif. (United Research Incorporated, Cambridge, Mass.). (AD 464256)

The delay theory of auditory localization is presented which provides a model for attention, location, and recognition wherein the function of the basilar membrane is that of a tapped delay line. It is shown that the same theory may be applied to speech recognition phenomena to show a consistency of the auditory mechanism in the perception and utilization of acoustic information. A new theory of information handling in the nervous system based on photon emission is described. The design and construction of insertion type electrostatic headphones is discussed and performance data given. Localization tests were conducted using the headphones which show that effective aural coupling is achieved. Improvements in devices developed for use in porpoise communication research are presented.

R 6

27,136

Bendat, J.S. & Thrall, G.P. A SUMMARY OF METHODS FOR ANALYZING NONSTATIONARY DATA. Contract NAS 7 100, JPL Tech. Rep. 32 744, Sept. 1965, 11pp. Jet Propulsion Lab., California Institute of Technology, Pasadena, Calif.

This Report summarizes theoretical ideas and techniques used for the analysis of nonstationary data. Details are presented for estimation of nonstationary mean values, correlation functions, and spectral density functions. 3 methods are discussed for estimating nonstationary mean values: ensemble averaging, short-time averaging, and orthogonal-function averaging. 3 methods are discussed for estimating nonstationary spectral density functions: double-frequency spectra, time-varying power spectra, and time-averaged power spectra.

R 7

27,137

Oshima, M., Fujimoto, T., Oguro, T., Tobimatsu, N., et al. ANTHROPOMETRY OF JAPANESE PILOT. FINAL REPORT MARCH 1961-MARCH 1962. Proj. 7184, Task 718408, AMRL TR 65 74, March 1965, 44pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Aero-medical Lab., Japanese Air Self-Defense Force, Tokyo, Japan). (AD 462062)

The results of an anthropometric survey of 239 pilots of the Japanese Air Self-Defense Force are presented. The survey took place in the spring of 1961 at 5 air bases located throughout Japan. 62 body dimensions were measured on each S by JASDF flight surgeons. Measurements of the head, face, trunk, arms, and legs were included for the purpose of sizing and designing pressure suits and associated protective gear for use in the F-104J weapon systems program. The percentiles, means, standard deviation, range and coefficient of variation are presented for each body measurement. Comparisons with the 1950 USAF flying population are included. A detailed description is given for each measurement accompanied by explanatory diagrams. A 4-size, Height-Weight program for JASDF pilots is presented for use by protective equipment designers.

27,138

Meehan, J.P. & Rader, R.D. MULTIPLE CHANNEL PHYSIOLOGICAL DATA ACQUISITION SYSTEM FOR RESTRAINED AND MOBILE SUBJECTS. Contract AF 04(695) 178, July 1965, 141pp. USAF Space Systems Div., Los Angeles, Calif. (Physiology Dept., University of Southern California, Los Angeles, Calif.). (AD 466893)

Miniature low power hardwire and telemetry data acquisition systems were developed. This development included sensors, signal conditioners, and oscillators designed to detect and transmit electrocardiogram, impedance pneumograph, blood pressure, temperature, and electroencephalogram data. The results of the technical program were a variety of signal conditioners and multiple channel transmitters which could be worn by mobile primate Ss. The result of the application of the instrumentation to acquiring baseline data was the evaluation of the effect of prolonged restraint and psychomotor training on the endocrine and autonomic systems. As a by-product of instrumentation requirements, a secondary result was a partial analysis of multiple feedback loop systems.

R 11

27,139

McKinney, N.P. LARYNGEAL FREQUENCY ANALYSIS FOR LINGUISTIC RESEARCH. Contract Nonr 1224(22), Proj. NR 049 122, CSL Rep. 14, Sept. 1965, 353pp. USN Information Systems Branch, ONR, Washington, D.C. (Communication Sciences Lab., University of Michigan, Ann Arbor, Mich.).

This study is concerned with the measurement of the fundamental laryngeal frequency in speech. The report begins with the definition of basic and supplementary terms which refer to signals and special devices employed in laryngeal frequency analysis. The literature relevant to laryngeal frequency analysis is reviewed in detail. Visual location of the laryngeal period boundaries is employed as the most suitable reference for evaluating techniques of automatic laryngeal frequency analysis. A laryngeal frequency analyzer is considered to consist of 3 essential components: a preprocessor, a basic extractor, and a post-processor. If the basic extractor of the laryngeal frequency analyzer is of the type which is sensitive only to zero crossings, the preprocessor output wave should have exactly 2 zero crossings per laryngeal period. It was found that the criterion of 2 zero crossings per period is satisfied if the amplitude of the first harmonic component is greater than the sum of the amplitudes of the other harmonic components when multiplied by their respective harmonic numbers. Harmonic analysis showed that squaring and full-wave rectification are more appropriate for increasing the relative level of the fundamental signal component than half-wave rectification or a logarithmic transformation. A set of speech waves was processed through several experimental analyzers, and 2 postprocessors employing different principles and having different characteristics of operation were compared.

R 398

27,140

Mancuso, S.J. CHECK TEST, LETTER REPORT FOR M24 AIRCRAFT PROTECTIVE MASK (ANTIGLARE-EYE-LENS OUTSERT) UNDER ARCTIC WINTER CONDITIONS. DA Proj. 1 B 6 43606 D 019 & USATECOM Proj. 5 3 6070 04 C, May 1965, 16pp. USA Arctic Test Center, APO, Seattle, Wash. (AD 465144)

This letter reports findings from the check test of the M24 Aircraft Protective Mask under Arctic conditions; specifically in regard to previously found shortcomings: the M2 Antiglare eye-lens outsert which had warped causing a distortion of vision, and the butyl rubber which separated from the nylon cloth when the E45 protective hood was manipulated after cold-soak below -30° F. It was found that the shape and size of the M24 mask eye lens required changing in order to facilitate peripheral vision and obviate flight safety problems under marginal weather; also a few further shortcomings were noted and recommendations for corrections made.

R 12

27,141

Kaufman, W.C. SKIN TEMPERATURE CHANGES CAUSED BY INTENSE DIFFUSE THERMAL RADIATION. FINAL REPORT OCTOBER 1961-AUGUST 1964. Proj. 7164, Task 716409, AMRL TR 65 64, April 1965, 10pp. USAF Biomedical Lab., Wright-Patterson AFB, Ohio. (AD 616698)

The rates at which critical levels of temperature are attained by the natural human skin exposed to intense thermal radiation have been studied using infrared quartz lamps. Early studies were done in a static aircraft in which a human S in the cockpit was exposed to thermal radiation produced by 1000 infrared lamps. Later, for more definitive studies, a radiometer and an infrared source, having irradiances that could be controlled between 0.06 and 0.7 cal/cm<sup>2</sup> sec, were constructed so that precise surface temperature measurements could be made during exposure to various intensities of thermal radiation. Spectra were varied by filtering through different substances. The whole dorsum of the hand was exposed and intradermal and subdermal temperatures were recorded from 0.13 mm thermocouples threaded through the skin. The rate of temperature rise is a function of the irradiance and the spectral characteristics of the source, the optical filter, and the skin. Plate glass, plexiglass, and a laminated glass aircraft windshield attenuated the temperature response by 0.3, 0.5, and 0.7 respectively in comparison with the unfiltered energy. Blackening the skin increased the rate of rise during exposure to plexiglass-filtered energy by a factor of 3.2. The rate of response to unfiltered energy increased by only a factor of 1.6. The rate of temperature change for natural skin exposed to intense thermal radiation is approximately 1/2 that of ink-blackened skin. These data have extensive civil defense, firefighting, and military application.

R 15

27,142

Hardaway, B.F. LETTER REPORT FOR EVALUATION--RANGER RATION. JRATA Proj. 2K 455.0, April 1965, 13pp. USA Advanced Research Projects Agency, APO, San Francisco, Calif. (AD 463447)

The purpose of this Ranger Ration project is to provide a field ration which satisfies the requirements of long range, deep penetration Vietnam operations for a lightweight, compact, and nourishing ration. It must be easy to prepare with a minimum cooking and water requirement and must consist of palatable foods indigenous to the country. The ration packet, composed mainly of pre-cooked dehydrated rice; fish, meat, and vegetable components; ration accessories, was evaluated in 3 areas of operation in Vietnam. It was found that: the ration components were suitable in taste to the Vietnamese and available; non-acclimatized storage for 9 months led to no deterioration; cooking, dehydration, and packaging of the rice component can be accomplished there, but not of the vegetable, meat, and fish components; 80% of respondents preferred this ration to that normally used; 37% indicated consumption for a 10 day period would not be desirable.

R 10

27,143

Hanavan, E.P., Jr. A PERSONALIZED MATHEMATICAL MODEL OF THE HUMAN BODY. Report from: "AIAA Second Annual Meeting, San Francisco, California, July 26-29, 1965." AIAA Paper 65 498, 1965, 14pp. USAF 6570th Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A personalized mathematical model to predict the inertial properties of the human body in any fixed body position is within the state of the art. Center of mass can generally be predicted within  $\pm 1.0$  in. and moments of inertia with  $\pm 15\%$ . The sensitivity of the inertial properties, especially  $I_{zz}$ , to small differences in body position and to errors in experimental procedure indicate that extreme care must be exercised in future experimental investigations. The design guide data emphasizes the importance of principal axes. In some positions, the principal axes are rotated as much as  $45^\circ$  from the body axes. Further investigation should be pursued to: a) improve the accuracy of the model by redesign of the hands and feet; b) determine the products of inertia of the body experimentally; c) modify the mathematical model to include external loads such as pressure suit, life support equipment, and tools; d) incorporate the latest data on distribution of body weight among the segments; and, e) use the model results as input data for analysis of astronaut maneuvering unit performance.

R 11

27,144

Biderman, A.D. NECESSARY, PERMISSIBLE, AND OBLIGATORY DISCOURSE WITH CAPTOR PERSONNEL. Report from: "Advisory Committee to the Secretary of the Air Force on Prisoners of War, Aug. 1963." Contract AF 49(638) 992, Proj. 9779, Task 9779 01, AFOSR 65 0750, May 1965, 10pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Bureau of Social Science Research, Inc., Washington, D.C.).

This report discusses circumstances under which discourse other than name, rank and serial number between prisoners of war and captor personnel may be necessary, permissible, or obligatory. Several examples are given in which this has been proven true because of requirements of international law, the maintenance of health, life and welfare of prisoners of war in an organized camp, for exploiting potential "friendlies" or defectors, for self-defense against false accusation, and in various special circumstances of cold or hot war. It is concluded that the "name, rank service number, date of birth, only" rule relates to an abstract conception of interrogation that is only sometimes congruent with actual confrontations with captor personnel that are experienced by prisoners of war. The considerations advanced here are independent of the issue of duress and "loss of self-control," except that there are dangers of confusing rational and moral action with rationalization of weakness.

27,145

Lis, R.J. FEASIBILITY REPORT. RADAR ACTIVATED CROSSPOINTER. Rep. RCS: 1 AFCS F3, April 1965, 15pp. USAF Communications Service, Hq., Scott AFB, Ill. (AD 462471)

This is a report of the feasibility of converting radar course error signals into data that can be applied to the 10-249 crosspoint indicator in an aircraft. The conceptual feasibility is valid but the operational profit is slight. The system would provide a redundant landing/training aid as long as the PAR system is operational. The technique generates information similar to ILS propagation that can be furnished at those installations where it is impractical or impossible to install an operational ILS. The system requires monitoring on PAR, and if distance measuring is not included in the design, the controller is required to give this information to the pilot, usually in one mile steps. This technique can be applied to any current PAR and to any load capacity desired (single or multiple approach).

27,146

Mehr, M.H. BIBLIOGRAPHY ON TRACKING CONTROLS. June 1965, 22pp. Measurements Systems, Incorporated, Norwalk, Conn.

274 references are included in this bibliography on tracking controls.

27,147

USA Natick Laboratories. FINAL REPORT ON THE DEVELOPMENT OF A PACK FOR VIETNAMESE AND THAI MILITARY FORCES. PHASE II. 1 MAY 1964-26 MARCH 1965. ARPA Order 267, Amendment 11, Program Code 4860, ca. 1965, 16pp. USA Natick Labs., Natick, Mass. (AD 463476)

This is a report of Phase II of a study on "Individual Clothing and Equipment for Indigenous Forces in Southeast Asia." Phase I has been described elsewhere (HEIAS 24,418). The purpose of Phase II was to complete the development/fabrication, and provide technical assistance for in-country production of a Ranger Pack for Vietnamese and Thai military forces. Loadcarrying systems embodying 3 basic design approaches were made and given a short evaluation. The first approach was an improved version of the equipment developed in Phase I using a rattan frame; in the second approach, the rattan frame was replaced by a small metal frame; and the third approach utilized a pack with no frame. In each system, there was a belt and suspenders to which the fighting equipment could be attached. A quick release system was provided to give a rapid dropping capability for the packs. The results of this evaluation indicated a decided preference for the approach with the metal frame. This pack is described in the report. The Thai pack is almost identical to that developed for Vietnamese forces; the difference being the 1 1/2 inch longer frames on the Thai packs based on anthropometric data. (HEIAS)

27,148

Morsh, J.E. EVOLUTION OF A JOB INVENTORY AND TRYOUT OF TASK RATING FACTORS. Proj. 7734, Task 773401, PRL TR 65 22, Dec. 1965, 28pp. USAF Personnel Research Lab., Lackland AFB, Tex.

The results of surveys of the Personnel Career Field conducted in 1959, 1961, 1963, and 1964 are reported. Improvements in inventory content and format and in administrative procedures were incorporated with each successive survey. In the last 2 surveys incumbents completed a background information sheet and rated the relative time spent on tasks. A computerized hierarchical grouping procedure applied to the time-spent data was used to identify and describe job types. In the 1962 survey 35 significant job types were found. In the 1964 survey 34 job types were identified. Job types tend to cut across commands and to some extent across grades and specialties. In the 1964 survey, in addition to relative time spent, subsamples of incumbents used 4 other task rating factors: technical assistance required, frequency of performance, difficulty of learning by on-the-job training, and training emphasis. Results of the tryout of these ratings are also reported.

R 6

27,149

Alford, D. NOTES ON HIGH ELEVATION RESEARCH WITH SELECTED BIBLIOGRAPHY. DA Task IV014501852A31, Spec. Rep. 78, Aug. 1965, 34pp. USA Cold Regions Research & Engineering Lab., Hanover, N.H. (AD 474577)

This paper represents the results of an extensive literature survey done in 1963 to define the problems which might be encountered at extreme elevations, to learn what is known of the parameters which might affect military operations, and to provide a base for further work in the area. The literature search led to the conclusion that very little research has been done in regions of extreme elevation; expeditions spend so much time combatting the environments that research would have been only a secondary objective. This paper is concerned primarily with the valley floors, mountain passes, and immediately adjacent slopes (the areas most pertinent for military operations). A general plan for a high-elevation research is outlined in an Appendix. Statements are presented of findings to date on the topics of: radiation, physical and mechanical properties of ice and snow, geological phenomena (e.g. glacier, weather), hydrology, meteorology, nutritional requirements, and transport. Also described are sites in the Andes of South America and the Himalayas of northern India which would lend themselves to such a research program. (HEIAS)

R 150 approx.

27,150

Bruinink, J. PROBLEMS OF COMBAT CLOTHING. Proj. G7 1050, FSTC 381 T64 211, April 1965, 7pp. USA Foreign Science & Technology Center, Washington, D.C. (Transl: De Militaire Spectator, (Dutch) 1964, 133(10), 472-475.). (AD 462923)

Requirements for combat clothing are listed: material requirements--outer and inner layers; design requirements--fit, air circulation, closure adjustments; psychological requirements--odor absorption, hindrance of body function; and protection requirements--thermal, radiation, chemical. Changes in combat clothing since 1958 are indicated and critical observations of currently used clothing are made. Finally, the newly developed and modified articles are described.

27,151

Bush, Wilma J., Gregg, Dolores K., Smith, E.A. & McBride, C.B. SOME INTERACTIONS BETWEEN INDIVIDUAL DIFFERENCES AND MODES OF INSTRUCTION. FINAL REPORT JANUARY 1964-MARCH 1965. Contract AF 33(615) 1460, Proj. 1710, Task 171007, AMRL TR 65 228, Dec. 1965, 19pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (West Texas State University, Canyon, Tex.).

This study explored the hypothesis that there is a relationship between patterns of learning ability and the amount learned in different instructional conditions. Scores for each of 44 Ss were obtained on (a) the Reading Vocabulary and the Mathematics Fundamentals subtests of the California Achievement Tests, (b) the Administrative and the Mechanical Scales from the Airman Qualifying Examination, and (c) the Verbal and Performance Scales of the Wechsler Adult Intelligence Scale. Each of the 44 Ss also learned in 5 different training situations. Differences between scores on associated subtests (e.g., Reading Vocabulary minus Mathematics Fundamentals) were correlated with the difference between gain scores obtained in the various learning situations. A significant relationship was observed between the difference on the subtests of the California Achievement Test and the difference between the gain score from lecture-like instruction and the gain score in laboratory-like instruction. The data tended to support the hypothesis that students with relative strength in Reading Vocabulary are superior to students with relative strength in Mathematics Fundamentals when both are required to learn from instructional conditions that are highly verbal. On the other hand, students exhibiting relative strength in Mathematics Fundamentals tend to learn more efficiently in individual laboratory situations than do students showing relative strength in Reading Vocabulary. No comparable patterns were revealed with the scores from the Wechsler Adult Intelligence Test or the Airman Qualifying Examination.

R 10

27,152

Burdick, D.C. & Goins, A.E. TARGET CAPABILITY VERSUS PRESUMED INTENTION AS A BASIS FOR DECISION IN COMBAT INFORMATION CENTERS. FINAL REPORT. NRL Prob. Y03 02, Proj. RF 005 01 41 4301, NRL Rep. 6180, March 1965, 93pp. USN Research Lab., Applications Research Div., ONR, Washington, D.C. (AD 613944)

The use of the opposing factors of target capability and target presumed intention as bases for decision by a sample of 131 CIC decision makers in 60 abstract tactical situations depicted by static displays was examined. Very wide differences in strategy and trade-off points were observed, with most decision makers weighting presumed intention more heavily. In comparison with rank and job experience, the CIC school attended was the most important factor correlating with decision strategy. Considerations of the S's consistency in his decisions, difficulty of problem, and the S's stated confidence in his decisions are discussed.

R 3

27,153

Hartman, B.O. FATIGUE EFFECTS IN 24-HOUR SIMULATED TRANSPORT FLIGHT. CHANGES IN PILOT PROFICIENCY. Tasks 775504 & 775506, SAM TR 65 16, April 1965, 4pp. USAF School of Aerospace Medicine, Brooks AFB, Tex.

Each of 4 pilots completed a 24-hour simulator flight broken into 11 2-hour legs terminated by an Instrument Landing System (ILS) landing. 2 kinds of performance measures are presented: (a) 20-sec. time-lapse photographs recorded airspeed, altitude, and rate of climb (or compass heading) through cruise portions of each leg; and (b) the ground-track record of the ILS approach was photographed after each landing. The cruise portions of each leg showed an increasing variability in performance, but this change did not significantly reduce overall system efficiency. Instrument approaches were carried out at a high level of proficiency for approximately 20 hours, at which point there was a precipitous drop in performance. Simultaneously recorded physiologic measures are being reported separately.

R 2

27,154

Kubyak, O.K. RELATION BETWEEN WORK SPAN AND REST PERIODS FOR PEOPLE OF VARIOUS AGES. JPRS 31, 268, TT: 65 31765, July 1965, 5pp. US Joint Publications Research Service, Washington, D.C. (Transl: Fiziologichnyy Zhurnal, July/Aug. 1964, 10(4), 521-523).

The goal of this research was to study the restoration period following an assigned work load in 3 different age groups of people. The time that was required for rest following the exertion of muscular strain of medium intensity in 3 age groups, i.e., 17-18 years (group I), 23-27 years (group II), 53-57 years (group III), was selected as an index. A finger ergograph was used. The experiments were conducted using medium loads for each age group. Medium load was defined as half the maximum load that the S could lift with his index finger flexors. 280 experiments were conducted with 26 Ss. At the beginning of each trial the time limit necessary for rest to restore the working capability after a 1-min. performance of a medium weight load and intensity, was set. The Ss thus performed 2 1-min. exercises with 1-min. intervals between them. The time necessary for the restoration of work capacity to the initial level after a performance of medium intensity and weight in persons of 3 different age groups differs in the duration. The ratio between work and rest period in persons of 3 different age groups, untrained in a given type of work, is as follows: 1:2.5 in the 17-18 age group; 1:2.7 in the 23-27 age group; 1:2.2 in the 53-57 age group. The rest period after training decreases variously in the 3 age groups: 2.8 times in group I; 4 times in group II; and 3.4 times in group III.

R 8

27,155

Hazel, J.T., Bourdon, R.D. & Madden, J.M. EFFECT OF SORTING PROCEDURE ON RANKING ERROR. Proj. 7734, Task 773402, PRL TR 65 3, Feb. 1965, 8pp. USAF Personnel Research Lab., Lackland AFB, Tex.

Ranking is often used to provide criterion measures, although the effect of varied sorting procedures on ranking accuracy is unknown. This study investigates the efficiency of 4 sorting methods varying in degree of structure. Efficiency was defined in terms of the absolute difference between the judged rank order of a series of 50 irregularly shaped figures graduated by size, and the rank order of these figures based on their physical measurement. Analysis of these errors revealed that the procedure with the greatest restriction of freedom was significantly more inefficient than 3 less restrictive procedures. With simple stimuli, there appears to be an optimal degree of structure, beyond which ranking efficiency decreases. Comparison of present with previous evidence suggests efficiency of sorting procedure may vary as a function of task complexity.

R 4

27,156

Hollender, H.A., Dymaza, H.A. & Klicka, M. DEVELOPMENT OF NUTRITIONALLY DEFINED METABOLIC DIETS FOR AEROSPACE TRAVEL. FINAL REPORT JANUARY 1964-DECEMBER 1964. Contract MIPR AMD AM 4 40011, Proj. 7164, Task 716405, AMRL TR 65 218, Dec. 1965, 15pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (USA Natick Labs., Food Div., Natick, Mass.).

Determination of the precise nutritional requirements of men in space requires a knowledge of, and careful control of, all environmental factors including the food consumed. The most suitable diet for experimental metabolic studies in a space system is therefore a nutrient defined diet composed of highly purified ingredients of known composition. Data compiled during the development of a nutrient defined diet in various flavors and physical forms are presented. The formulation of a liquid form of this diet including the nutrient composition, emulsion stability, antifoaming agents, flavor selection, and the techniques of packaging are discussed. An assessment of the organoleptic quality of the U.S. Army Natick Laboratories (NLABS) liquid nutrient defined diet by taste panel experts revealed a rating of 6.0 or above for the vanilla and chocolate flavors using a 9 point hedonic scale. Although slightly acceptable to taste panelists, this diet needs major flavor improvement if it is to be considered for use as the sole nutrient source for humans for prolonged periods of time. At the present time, this nutrient defined formulation is considered the best available liquid diet for sole support of humans in aerospace systems.

R 1

27,157

Owsowitz, S. & Sweetland, A. FACTORS AFFECTING CODING ERRORS. Contract AF 49(638) 700, RM 4346 PR, April 1965, 29pp. Rand Corporation, Santa Monica, Calif. (AD 614415)

This Memorandum describes several experiments which sought to identify the factors that contribute to coding errors. The experiments used several kinds of code-stimulus materials: numeric codes; alpha codes; alpha-numeric codes; and mnemonic codes (natural abbreviations, such as "OVH for 'overheated'"). Only 3-character codes were used in the series. Air Force maintenance personnel were used as Ss of the experiments, in which their coding routine resembled their method of recording real-world maintenance data. Their coded information was keypunched, and the resulting decks were analyzed to determine what factors led to the highest and lowest error rates. Some of the major findings were: a) Coding errors are proportional to the alpha content. Numeric codes have the smallest error rates. As the alpha content increases, so does the error rate. b) Perceptual set can increase or reduce error rates; c) Most coding errors (75 to 95%) result from having a single digit in error. The remainder result from reversals or copying the wrong code, d) The use of mnemonic codes did not reduce coding errors, apparently because the task involved no learning; e) Coding errors can be substantially reduced by providing keypunchers with a list of codes; f) The amount of usable information that is retrievable from coded information depends on 3 factors: 1) the error rate; 2) the number of codes used; and 3) the number of codes possible with the format in question.



27,159

Gresham, S.C., Agnew, H.W., Jr. & Williams, R.L. THE SLEEP OF DEPRESSED PATIENTS. Arch. gen. Psychiat., Dec. 1965, 13, 503-507. (Psychiatry Dept., University of Florida College of Medicine, Gainesville, Fla.). (Reprint)

8 depressed psychiatric inpatients were selected on the basis of 6 tests and studied with closely matched controls for 4 consecutive nights in a laboratory controlled for noise, temperature, and lighting with continuous all-night EEG and eye movement recordings. The first-night records were not used for analyses. The average percent sleep stage amounts over 3 nights were compiled by observers other than the E. The patients obtained more wakefulness, less sleep stage 4, and a slightly longer sleep latency. 4 of the patients, with proper controls were available for a second study after therapy, and showed a decrease in all differences toward the values obtained by their controls.

R 9

27,160

Soliday, S.M. EFFECTS OF TASK LOADING ON PILOT PERFORMANCE DURING SIMULATED LOW-ALTITUDE HIGH-SPEED FLIGHT. Contract DA 44 177 AMC 66(t), Proj. 1D131201D159, USATRECOM 64 69, Feb. 1965, 79pp. USA Transportation Research Command, Fort Eustis, Va. (North American Aviation, Incorporated, Columbus, Ohio). (AD 614243)

The effects of task loading on pilot performance during simulated low-altitude, high-speed flight were studied. Approximately 210 hours of flight were made by experienced pilots in a moving-base simulator that had a total vertical travel of 12 feet and an acceleration capability of  $\pm 6G$ . The flights were made over several types of terrain at several airspeeds under different conditions of navigation task and emergency task loading. Medium-heavy turbulence was simulated for all flights. Data were analyzed in terms of human performance aspects of the missions.

R 10

27,161

Higginbottom, G. DEVELOPMENT AND EVALUATION OF AN INFRARED RADIANT HEAT TEST APPARATUS FOR FIRE FIGHTERS' ALUMINIZED PROXIMITY FABRICS. FINAL REPORT. RENS T FO15 14 07 007 003, June 1965, 21pp. USN Supply Research & Development Facility, Bureau of Supplies & Accounts, Bayonne, N.J. (AD 471181)

This report describes the development and evaluation of an infrared radiant heat test apparatus that can be used for the determination of heat reflectance properties of standard or experimental aluminized fire fighters' fabrics. Detailed construction of the test apparatus, test procedure, and method of calibration are furnished. Also included are the effects of varied infrared radiant heat intensities and exposure times on 2 representative fabrics. The apparatus possesses fewer variables, is easier to control, and affords better reproducibility than the test apparatus now required in specifications for fire fighters' fabrics.

R 5

27,162

Kauffman, F.L. & Harlan, J.W. DEVELOPMENT OF READY-TO-EAT RATION TYPE BEEF ITEMS. Contract DA19 129 QM 1897, Proj. Ref. 7 84 01 002, Tech. Rep. FD 5, Feb. 1965, 21pp. USA Natick Labs., Natick, Mass. (Research Labs., Swift & Company, Chicago, Ill.). (AD 613349)

Beef products when given sterilizing doses of irradiation have an odor and flavor which is objectionable to many people. The reduction or masking of this odor and flavor was a primary purpose of this research. Many additives and numerous variables and techniques were evaluated. Beef cooked in barbecue sauce, beef sauce or mushroom sauce reduced irradiation flavor compared to untreated controls and had a fair acceptability in consumer tests. Protein hydrolysates pumped into the beef before slicing also lowered ultimate irradiation flavor. Beef must be enzyme-inactivated in order to make it shelf-stable. This enzyme inactivation has been done by heating to 77°C and results in a partially cooked product. When it is reheated prior to serving it has a "warmed over" flavor that is not desirable. To improve this aspect of beef steak quality we have evaluated steak preparation methods based on lower temperatures for longer times. It was found that steaks heat-enzyme-inactivated at 65°C and 50% relative humidity for 15 minutes, or at 57°C and 90% relative humidity for 60 minutes, had a greatly reduced "warmed over" flavor.

27,163

Jones, R.L. & Lindsey, J.F. HUMAN FACTORS ASPECTS OF LOW-ALTITUDE FLIGHT: A SAMPLE OF FIGHTER PILOT ATTITUDES AND ALTITUDE ESTIMATES. Proj. 9069Z, APGC TR 65 35, PGN Doc. 64 1, May 1965, 170pp. USAF Air Proving Ground Center, Eglin AFB, Fla. (AD 461867)

The attitudes of a sample of highly qualified fighter pilots concerning various specific aspects of low-altitude flight were investigated. Specific factors considered included a) the opinions of these pilots concerning their ability, as well as the ability of fellow pilots, to perform low-altitude flight (500 ft or below); b) estimates of the lowest altitudes the pilots could comfortably maintain for certain specified conditions; and c) relationships between human factors aspects such as anxiety level, total flying hours, and total jet time and estimates of lowest altitudes maintainable for specified conditions. 67 USAF (TAC) fighter pilots comprised the sample. The results indicated that a) attitude data pertaining to low-altitude flight can be analyzed adequately by using the chi-square technique; b) the pilots sampled manifested a high degree of confidence in their ability, and the ability of their colleagues, to perform low-altitude flight and navigation; c) there were significant differences among the minimum altitudes the pilots stated they would fly under various specified conditions of terrain, turbulence, visibility, speed, and flight time; d) there were significant differences among the minimum altitudes the pilots stated they would fly, when these pilots were grouped according to levels of IPAT anxiety and total jet time; e) there appears to be a relationship between certain personality factors (ego strength and overt anxiety) and the minimum altitude estimates made by the pilots, and finally, f) the data collected and analyzed could be used to furnish guidelines for establishing certain test parameters, as demonstrated by an example of practical application in selecting altitude limits for certain specified conditions. The results of, perhaps, the most immediate operational value are the pilots' estimates of altitude ranges for certain conditions and data relating pilot anxiety level to altitude estimates. R 7

27,164

Kohn, B. & Bryden, M.P. THE EFFECT OF LYSERGIC ACID DIETHYLAMIDE (LSD-25) ON PERCEPTION WITH STABILIZED IMAGES. Psychopharmacologia, 1965, 7, 311-320. (Psychology Dept., McGill University, Montreal, Quebec, Canada). (Reprint)

2 experiments were conducted to investigate the effects of lysergic acid diethylamide on patterns of fading and regeneration of stabilized retinal images. Under the drug, the whole target was visible more often than with a placebo, and distortions of the target were reported more frequently. In addition, the visibility of the vertical components of the targets increased under LSD-25. These changes, however, depended on the orientation of the figure. In the placebo sessions, the left side of the figures was visible more often. Possible factors contributing to these results are discussed.

R 18

27,165

Feallock, J.B., Bahrack, H.P. & Ornstein, G.N. TIME, UNCERTAINTY, AND INCENTIVE VARIABLES IN COMPOSITE TASK PERFORMANCE. FINAL REPORT, 30 JUNE 1964-30 SEPTEMBER 1965. Contract 4480 4480(00), Proj. NR 196 040, Rep. NA65H 913, Sept. 1965, 44pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (North American Aviation, Inc., Columbus, Ohio).

Within complex man-machine systems, individual operators are commonly required to perform 2 or more functions concurrently. This report describes 2 empirical evaluations of the effects of variables common to complex systems upon the performance of a composite task comprised of 2 serial tasks. The first study investigated the effects of signal rate, signal duration and signal onset predictability upon performance accuracy and latency. Accuracy scores were insensitive to all 3 independent variables. In the second study, 2 variables were evaluated for their effects upon the accuracy of performance on the individual channels. One variable was the redundancy of signals on the second channel; the other was the ratio of incentive pay for the first and second channels. Performance improved reliably with signal redundancy for only the channel whose signal redundancy was increased. Different ratios of incentive pay did not produce reliable differences in performance for either channel, although certain trends were noted.

R 29

27,167

Wheeler, D.C. PHYSICAL STANDARDS IN ALLIED AND ENEMY ARMIES DURING WORLD WAR II. Military Med., Sept. 1965, 130(9), 899-916. (USA Medical Service, Walter Reed Army Medical Center, Washington, D.C.).

The problem of establishing and maintaining physical standards at a level sufficiently high to provide the several Armed Forces with large numbers of fit personnel was a difficult one. This paper illustrates the fact that the various responses posited to that challenge in World War II by the major Allied and Axis powers were unique solutions to specialized requirements. Elements of these responses were borrowed by the various nations at the termination of conflict. With the additional burdens placed on the common soldier by the Atomic Age, it appears certain that the maintenance of high physical standards will continue to be a preoccupation of commanders and professional men alike. Large-scale mobilization would require employment in wartime of the World War II legacy of widespread concern about standards. Hopefully, such an eventuality will not soon come to pass.

R 23

27,168

McCartney, A.J. A CONSIDERATION OF THE BIOLOGICAL EFFECTS OF LASER. Military Med., Nov. 1965, 130(11), 1069-1077. (USA Medical Research Lab., Biophysics Div., Fort Knox, Ky.).

The physical properties of laser radiation are described. An attempt is made to correlate these properties with the observed biological effects. The biological effects of laser are described in some detail with regard to: intact animals; primate eyes; skin; and malignant tumors of animal and human origin. Within the present state of the technology, laser does not represent a lethal hazard to man. However, laser radiation is capable of inflicting severe damage on the unprotected eye, and all due safety precautions should be observed with regard to this hazard. The continuing rapid development of laser technology assures an increasingly important role for laser in future scientific and technological applications. The relative importance of laser in medicine remains to be determined but preliminary reports indicate some promise in selected fields, particularly in cellular research, cancer therapy, and ophthalmology.

R 39

27,169

Holmstrom, E.I. AN EXPERIMENTAL TEST OF A THEORY OF RESPONDENT BEHAVIOR. Contract Nonr 1181(11), Proj. NR 177 470, Tech. Rep. 19, Sept. 1965, 45pp. Duke University, Durham, N.C. (AD 622504)

An experiment was conducted in which methodologically imperfect conditions conducive to content-irrelevant responding were created. Ss' responses to unstructured questionnaires given under "normal" test conditions were compared with responses obtained from the same Ss given to structured questionnaires under "biased" conditions. Judges were used to determine the degree or extent of deviation in responses given to the subsequent or experimental questionnaire. The results indicate first that the use of structured questionnaires increases Ss' evaluation apprehension in that Ss were found to endorse socially-desirable statements more than undesirable statements. Second, Ss, in general, yielded to the biasing effects of the social aspects of the research situation and endorsed both socially-desirable and undesirable items, deviating from their original positions. Third, interest in item-content reduced Ss' content-irrelevant responding, even under explicit social pressures. Fourth, the effects of instrument and personality variables were, to a large degree, dependent on other situational factors, such as interest in item-content and the relevancy of the social aspects of the research situation.

R 29

27,170

Finck, P.A. BALLISTIC AND FORENSIC PATHOLOGIC ASPECTS OF MISSILE WOUNDS. CONVERSION BETWEEN ANGLO-AMERICAN AND METRIC-SYSTEM UNITS. Military Med., June 1965, 130(5), 545-569. (US Armed Forces Institute of Pathology, Washington, D.C.).

The purpose of this paper is to provide means of interpreting and converting some of the various factors involved in the kinetic energy of projectiles. It is intended for those who deal with missile wounds: investigators, lawyers, and physicians, particularly pathologists and surgeons. Conversion tables between Anglo-American and metric-system units are provided for the convenience of those, particularly the members of the Armed Forces, who have to evaluate data coming from other countries and who do not always have numerous bulky reference books at their disposal. It is strongly recommended that investigators, pathologists, and surgeons include in their reports the description and photograph of missiles, as well as their weight, velocity, and kinetic energy upon impact. Such data are of great value in the interpretation of the injuries and the evaluation of weapons. The tissue damage by a projectile is related to the character of the tissue, the shape and presented area, the components, the weight, and the velocity of the missile. Generally, the greater the velocity, the greater the kinetic energy, the larger the temporary and permanent cavities, and the more severe the tissue damage will be. Temporary cavities last only a few milliseconds. In high-velocity missile lesions (above 2,500 ft/sec or 750 m/sec), a large temporary cavity formation explains tissue damage some distance away from the missile track.

R 29

27,171

Mason, J.K. AIRCRAFT ACCIDENT PATHOLOGY: A STUDY IN COOPERATION. Military Med., June 1965, 130(6), 578-585.

The purpose of this paper has been to show that the pathologist's contribution to accident investigation is very valuable but that it is only within the framework of a cooperative effort that his value is maximal. The relationships into which the pathologist must enter have been described. It follows that all the other observers who have been incorporated must have mental lists of their own which include the pathologist. The pathologist should be high on these lists, but how high he is placed will depend on 2 factors--the particular and the general. The standing of the particular pathologist depends, naturally on his efficiency but also on the degree of effort he will make to improve his contribution to the investigation by backing his autopsy findings with ancillary, non-medical, observations which, ideally, should be personal and not from hearsay. In general, the standing of pathologists in accident work will only be high if all pathologists so engaged will orientate their efforts to the saving of future lives rather than to a simple matter of establishing a cause of death.

R 14

27,172

Baldrige, H.D., Jr. TOXICOLOGICAL ASPECTS OF MISSILES AND NUCLEAR SUBMARINE WARFARE. Military Med., May 1965, 130(5), 505-511. (USN Special Projects Office, Bureau of Naval Weapons, Washington, D.C.).

In the change of the nature of warfare from hot to cold, from active combat to watchful waiting, increasing emphasis has been directed to man as a vital link in weapon system effectiveness. If a weapon must be held ready for action for extended periods of time, then the men whose responsibility it is to maintain and operate the system must also be continually capable of optimum performance. One of the characteristics of this new form of warfare is the encapsulation of men and machine under conditions of toxicological significance. Military chemists and toxicologists have become members of weapon research and development teams in an effort to insure that hazardous chemicals will be controlled in the deployment of such weapons to the limit permitted by operational requirements. Participation of these scientific disciplines in the hardware design phases of military research and development programs minimizes the possibility of later perhaps very costly substitutions of material or modification of operational doctrine. In rocket operations where laws of gas dynamics require the use of large quantities of types of chemical compounds which are inherently hazardous to man, the role of the chemist and toxicologist is primarily one of crew protection against an acute hazard potential. With closed atmospheres such as those aboard submarines and other encapsulated weapons systems where emphasis is on possible chronic inhalation toxicity, greater consideration is given to actual selection of chemical materials by design engineers and to the conditions of usage.

R 8

27,173

Kiel, F.W. HAZARDS OF MILITARY PARACHUTING. Military Med., May 1965, 130(5), 512-521. (US Armed Forces Institute of Pathology, Washington, D.C.).

Parachuting has existed for 180 yrs but has gained military prominence only in recent years. Several hundred thousand parachutists have been trained in the armed services. Although parachuting is a potentially hazardous activity, injuries of a nature to keep one from duty are not common, being less than 1 per 300 jumps. Fatalities associated with jumping are rare--approximately 1 in 50,000 jumps. Most of the injuries have involved the weight-bearing areas of the body--legs and back. Fatalities, though usually thought of as the multiple extreme injuries of abrupt ground deceleration, have many other causes. Deaths have occurred from wind dragging, landing in water, head injury, collision with airplanes, and electrocution on a power line. A few miraculous escapes are known in parachuting--survival of a fall from great height without the aid of a parachute. Such events usually have the benefit of a long decelerative interval because of landing in plowed fields, trees, or snow and an optimal diffusion of body impact such as landing on the back in a spread-eagle position.

R 20

27,174

Wispart, I.S. & Warskow, M.A. STATISTICAL ANALYSIS OF AIRCRAFT DELAY. FINAL REPORT. Contract FAA/BRD 403, AIL Rep. 1400 6, July 1965, 29pp. Airborne Instruments Lab., Cutler-Hammer, Inc., Deer Park, N.Y. (AD 619445)

The purpose of this work is to analyze the delay to samples of various segments of the aircraft population (air carrier, general aviation, military, and one airline) and to determine the extent to which the amounts of delay are typical of the average delay of the total traffic. Information obtained in previous AIL work for the FAA and others was used as the basis for this study. The data were selected from days during the years from 1961 to 1964; the delays to aircraft operating during the busiest hours of those days were analyzed. Aircraft that experienced no delays during these hours were included in the sample. Sample sized for each case analyzed were as high as 361. There was a total of 33 cases in addition to 3 composites. The total number of samples was 5054. A computer performed the statistical analysis of the data from 6 major airports in the United States. For each of the total-traffic samples, 95% confidence intervals were computed and the average delays of each segment were tested to determine whether they were within the confidence intervals. Based on the 6 airports studied, it is generally believed that at the major air-carrier airports air-carrier delay is a good representative of total-traffic delay. However, the delays experienced by general aviation and a single airline (United Airlines was selected) were found to be significantly different from the total-traffic delays. It was also found that United Airlines delays for the cases studied were not typical of total air-carrier delays.

R 3

27,175

Efthimides, A.D. FORD INGENUITY AIDS TEST AND DEVELOPMENT OPERATIONS IN LATIN AMERICA. SAE J., Sept. 1965, 73(9), 54-55. (Ford Motor Company, South America & Mexico).

Ingeniuty, coupled with programed goals, is helping Ford in Latin America to overcome equipment, materials, personnel, and "local content" limitations in its vital test and development operations. There, its test and development departments centralize activities of the structures laboratories, dynamometers, carburetor flow-rooms, and vehicle testing. These activities in turn support and service the needs of the engineering design departments. Within the Argentine and Mexican Ford plants, these departments also operate modest vehicle test tracks.

R 1

27,176

Turnbow, J.W., Haley, J.L., Jr., Mohler, S.R., Swearingen, J.J., et al. PLANE-CRASH RESEARCH LEADS WAY TO LOWER LIFE LOSS. SAE J., June 1965, 73(6), 38-44. (Arizona State University, Tempe, Ariz.).

Fatality and injury rates in aircraft accidents can be decreased. If an accident is potentially survivable--in other words, if deceleration forces on the occupants do not exceed human limits, and the passenger cabin is sufficiently intact to provide living space--the following 3 factors can determine survival: the seats and restraint systems; evacuation of the airplane; and passenger survival after evacuation.

R 3

27,177

Armstrong, W.T. SELECTED COMMENTS ON THE DESIGN AND EVALUATION OF COCKPIT CONTROLS. No date, 2pp.

The theme of these remarks was that statistical analysis and laboratory experiments should be placed in proper perspective in the design and evaluation of cockpit controls, that these techniques should not supplant operational experience or be used to optimize the final configuration for the flight environment without intensive qualitative assessment by the people who must rely on the suitability of the end product.

27,178

Enslow, P.H., Jr. A BIBLIOGRAPHY OF SEARCH THEORY AND RECONNAISSANCE THEORY LITERATURE. Contract DA 36 039 AMC 03761(E), Proj. 1 PO 21101 A042 01 01, Tech. Rep. 1906 2, Rep. SU SEL 65 039, June 1965, 38pp. Stanford Electronics Labs., Stanford University, Stanford, Calif. (AD 471315)

This report consists of 75 items on search theory and reconnaissance theory found in periodicals and technical reports. Each entry includes a short summary or quotation from the pertinent abstract. Items are grouped as follows: a) General Discussion of Problems; b) Allocation of Effort; c) Game Theory Formulation; d) Geometric Search Patterns; e) Measures of Performance; f) Miscellaneous.

R 75

27,179

Siskel, M., Jr., Lane, F.D., Powe, W.E. & Flexman, R.E. INTRA-CREW COMMUNICATION OF B-52 AND KC-135 STUDENT AND COMBAT CREWS DURING SELECTED MISSION SEGMENTS. FINAL REPORT MAY 1963-JANUARY 1964. Contract AF 33(616) 7681, Proj. 1710, Task 171003, AMRL TR 65 18, May 1965, 22pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Bell Aerosystems Company, Bell Aerospace Corporation, Buffalo, N.Y.).

An experiment was carried out to compare within-crew communications in B-52 and KC-135 aircraft during peacetime training flights as functions of crew experience and selected mission segments. Crew transmission and message rates were obtained from tape recordings of crew communications on the aircraft interphone system during takeoffs and bomb runs in the bomber and takeoffs and air refuelings in the tanker. In each case, samples were obtained from student crew solo missions and from the combat crew training missions. On the basis of earlier work, it was hypothesized that as a result of their lower level of coordination, the less experienced student crews would have a higher rate of communication than the more experienced combat crews. In 2 of the comparisons, this hypothesis was confirmed while in 2 others it was not. Because none of the differences were statistically significant, the results were discussed in terms of the trends which were indicated and several unavoidable compromises in experimental control.

R 1

27,180

Kidwell, J.L., Squeglia, N.L. & Lavender, H.J. ESCAPE PROBABILITY AS A SYSTEMS DESIGN PARAMETER. Technical Transactions, 1965, 486-499. (Lycoming Div., Avco Corporation, Stratford, Conn.). (Reprint)

Escape Probability is the probability of a discrepant item passing through established check points with an ensuing system failure as a result. Such an occurrence is statistically probable; it is also obvious that this potential degradation factor of systems quality could be used as a design parameter, particularly if it could be quantified. This paper will discuss the application of this philosophy to the design phase of the systems development to approach minimization of the effect of Escape Probability on systems quality. The purpose of this discussion is to develop an attitude of systems orientation in regard to quality control so that intelligent manipulation of manufacturing degradation factors can be taken to optimize inspection and to allow realization of effective product systems quality.

R 22

27,181

Purvis, R.E., Mallory, W.K. & McLaughlin, R.L. VALIDATION OF QUEUING TECHNIQUES FOR DETERMINING SYSTEM MANNING AND RELATED SUPPORT REQUIREMENTS. FINAL REPORT FEBRUARY 1964-OCTOBER 1964. Contract AF 33(657) 11607, Proj. 1710, Task 171006, AMRL TR 65 32, March 1965, 125pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Radio Corporation of America, Camden, N.J.).

A program was conducted to establish the validity and reliability of a technique of mathematical modeling for predicting manning requirements for weapon systems. The technique was applied to 2 systems; the F105D fire control system (FCS), which presently is operational; and the C141 systems, which is scheduled for operation in the near future. The model prediction for the FCS, using field data for parameter estimation, yielded good results when compared with operational performance. Moreover, it was shown that the operational performance could be achieved by 34% less personnel than the manning set by the table of organization. The model prediction for the FCS, using conceptual data, resulted in substantially the same manning for the maintenance shop as that developed from the measured data; but, because maintenance concepts had been changed in the field, the number of flightline airmen was larger than the measured data. The manning prediction for the C141 system, based on operational rates planned for the system and field data on the C130 system, resulted in a prediction of 819 airmen in the organizational maintenance squadron and 476 airmen in field maintenance squadron. With the predicted manning it could be expected that an operational readiness of 78% could be maintained.

R 8

27,182

Price, H.E., Behan, R.A. & Ereneta, W.J. REQUIREMENTS AND CONSTRAINTS OF POTENTIAL ROLES OF SUPERSONIC TRANSPORT CREWS. Contract NAS 2 2209, NASA CR 146, Jan. 1965, 375pp. National Aeronautics & Space Administration, Washington, D.C. (Serendipity Associates, Chatsworth, Calif.).

This document contains technical information for organizations involved in the development and operation of supersonic transports (SST). One section of the report contains information on the anticipated flight envelopes for SST, descriptions of individual phases of flight, and discussion of sonic boom and air traffic control factors. Another section discusses requirements and constraints and the implications of these for the crew. A final section describes potential roles of the flight crew in terms of a) system considerations which affect the crew, b) crew role variables, c) operational considerations and the crew, d) crew composition, and e) flight deck concepts. (HEIAS)

R 65

27,183

Wright, E.H. EVALUATION OF PLANS FOR THE CONTROL OF AIR TRAFFIC IN THE GREATER KANSAS CITY TERMINAL AREA. FINAL REPORT. Proj. 150 510 OIV, Rep. RD 65 47, May 1965, 31pp. US Systems Research & Development Service, FAA, Atlantic City, N.J. (AD 619707)

Plans for the control of air traffic in the Greater Kansas City Terminal Area were evaluated to determine optimum control procedures, traffic flow patterns and equipment configurations. The dynamic air traffic control simulation facilities at the National Aviation Facilities Experimental Center were used in conducting the evaluation. The Federal Aviation Agency Central Region concept combined the control of instrument flight rule traffic operating at Kansas City Municipal, Mid-Continent International, Richards-Gebaur AFB, Olathe NAS, Sherman AAF and St. Joseph Airports at the Kansas City Terminal Radar Approach Control Facility. In addition the concept required that both Kansas City Municipal Airport and the Mid-Continent International Airport be considered as a primary terminal. The evaluation was conducted accordingly. It was concluded that the control procedures, traffic flow patterns, and equipment configurations contained in the final plan were optimum. It was recommended that the final plan be considered for implementation.

27,184

Kreifeldt, J.G. A SAMPLED-DATA PURSUIT TRACKING MODEL. Contract NsG 107 61, DSR 9991 2, Jan. 1965, 24pp. Mechanical Engineering Dept., Massachusetts Institute of Technology, Cambridge, Mass.

A sampled-data pursuit hand tracking model for the human operator is developed and tested. The model embodies the simplest a priori assumptions about human tracking behavior. The analytical model is presented along with the experimentally determined frequency transfer characteristics of an analog computer built to have the same transmittance as the mathematical model. Generally good agreement was obtained in matching the model's frequency and time domain responses to those of a well-trained human tracking in pursuit fashion an input spectrum flat to 0.64 cps.

R 5

27,185

Stillwell, W.H. X-15 RESEARCH RESULTS WITH A SELECTED BIBLIOGRAPHY. NASA SP 60, 1965, 128pp. Scientific & Technical Information Div., National Aeronautics & Space Administration, Washington, D.C.

This is a semi-technical summary of the X-15 program. Chapters are entitled: a) the role of the X-15; b) the first hypersonic airplane; c) developing a concept; d) flight research; e) aerodynamic characteristics of supersonic-hypersonic flight; f) the dynamics of flight; g) man-machine integration; and h) a flying laboratory. (HEIAS)

R many

27,186

Coulson, J.E. & Cogswell, J.F. SYSTEMS ANALYSIS IN EDUCATION. Report from: "Conference on the Development and Use of Data Banks for Educational Research, Boston, December 4, 1964." SP 1863, Jan. 1965, 14pp. System Development Corporation, Santa Monica, Calif. (AD 611865)

This paper is concerned with systems analysis in education. The systems analysis process is described in fairly concrete terms, giving specific examples of the procedures and products of such analysis. At the conclusion of the paper, some possible implications of systems analysis procedures for educational data banks are discussed.

R 2

27,187

Edwards, W.D. HUMAN PROCESSING OF EQUIVOCAL INFORMATION. FINAL REPORT. Contract AF 19(604) 7393, Proj. 4690, Rep. 3780 23 F, April 1965, 80pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (University of Michigan, Ann Arbor, Mich.). (AD 613949)

This report contains a series of studies investigating the abilities of Ss to revise probability estimates on the basis of new information. These studies show that Ss' probability estimates are reliable, but deviate considerably from posterior probabilities calculated from Bayes' theorem. These deviations are almost always in the conservative direction, i.e., low Bayesian probabilities are overestimated, and high ones are underestimated. Only when each datum is very ambiguous do Ss' estimates become more extreme than Bayesian probabilities. Further, when Ss are asked to give 90% or 50% credible intervals of a posterior probability distribution, their estimates are wider than Bayesian credible intervals. This finding of conservatism has led to the design of a man-computer system that should minimize the effects of human shortcomings in making diagnoses.

R 14

27,188

Gagliardi, U.O., Hussey, R.A., Kaplan, I.T. & Mattels, R.J. MAN-COMPUTER INTERACTIONS IN IDEALIZED TACTICAL PROBLEM SOLVING. FINAL REPORT. Contract Nonr 3602(00), May 1965, 87pp. USN Office of Naval Research, Washington, D.C. (Dunlap & Associates, Inc., Darien, Conn.).

The aim of this research was to develop a method for the design of automated problem-solving aids. The approach taken was to examine human performance for evidence of inadequate heuristic procedures indicating processing overloads which could be eliminated by appropriate automated procedures. The problems used were selected because they have a formal structure which admits many interpretations--from the design of minimal switching circuits to the disposition of weapon systems. The S's task was to allocate hypothetical missile-firing submarines so that a specified number of targets was covered, by the fewest possible ships. This task could be formulated as a linear integer programming problem which was solvable by Gomory's algorithm. However, complete automation of the task, using this algorithm, was undesirable, because the procedure was excessively time-consuming when more than a few solutions were required. Experiments indicated that the S's processing limitations resulted in a slow and biased search for elements from which to assemble solutions. The aided system delegated the subtask of finding key elements to an automated process and let the person assemble these elements into deployments. The effectiveness of this arrangement was shown by the fact that aided Ss found more and more uniformly distributed solutions than unaided Ss. In order to further tests and develop automated problem-solving aids, we have developed an operating system which allows experimentation with dynamic tasks. A simple example of such a task is presented in the report.

R 3

27,189

Abraham, L.H. "SPACE TECHNOLOGY. VOLUME I." SPACECRAFT SYSTEMS. Grant Nsg 598, NASA SP 65, 1965, 85pp. National Aeronautics & Space Administration, Washington, D.C. (Douglas Aircraft Company, Santa Monica, Calif.).

This is the first of a series of publications prepared as notes for a course in space technology given in 1964. Sizing of the vehicle, material selection, and design of manned space cabins are some of the topics covered. (HEIAS)

27,190

Pask, G., Lewis, B.N., Moore, C.H., Watts, D., et al. GROUP DECISION MAKING AND COMMUNICATION PATTERNS UNDER CONDITIONS OF STRESS AND OVERLOAD, WHEN THE PARTICIPANTS ARE PERMITTED TO FUNCTION AS A SELF-ORGANIZING SYSTEM. FINAL TECHNICAL REPORT, 1 JANUARY 1964-31 DECEMBER 1964, Contract DA 91 591 EUC 3216, Proj. 2J012001B706, Subtask 01 01, Feb. 1965, 72pp. System Research Ltd., Richmond, Surrey, England. (AD 462108)

This report briefly reviews some problems concerned with the distribution of control amongst the members of small groups engaged in data processing. One issue of practical consequence is whether or not it is possible to use information about the changes in characteristics of group members (due to learning and the effect of fatigue) in order to advantageously reassign the roles or functions of these participants (in contrast to assigning roles on an initially determined basis). The report describes a continuation of previous experiments in which an adaptive control mechanism is used to perform these reassignments. A fairly detailed analysis of the experimental data indicates that adaptively controlled reassignments improve performance and stability, in particular when the participants are fatigued. However, it also seems that a greater improvement is possible if the procedure takes into account preference assertions from the Ss, and provides the Ss with data regarding properties of their performance. The resulting arrangement is an hierarchical organization and a self-organizing system. Further relevant work is considered.

27,191

McKendry, J.M. UTILITY OF INFORMATION AS A PREDICTOR OF DECISION ADEQUACY IN AMBIGUOUS CHOICE SITUATIONS. Rep. 567 R 3, July 1965, 19pp. HRB Singer, Incorporated, State College, Penn. (AD 466844)

In ambiguous choice situations assessing information value through the application of decision and information theories is normally precluded by the lack of adequate descriptions of the stimulus and response sets. The paper describes an empirical feasibility check on the possibility of using judgmentally derived information utility measures as a substitute metric. Employing 128 undergraduate males in a mock anti-submarine warfare situation in which it was possible to derive a rational criterion for information value, each of 4 separate items of information was studied utilizing these items presented alone or in combination with others; i.e., 16 different treatment conditions were used with 8 Ss randomly assigned to each condition. Before and after testing, paired comparison utility scales were obtained from the Ss. Performance was measured in terms of the total number of shots required to sink a fixed number of submarines. Results were sufficiently promising to merit further development of this approach to information measurement.

R 10

27,192

Fujinaka, E.S. & MacDonald, J.L. RESEARCH AND DEVELOPMENT OF BLAST PROTECTIVE FOOTWEAR. FINAL REPORT (PHASE I). Contract DA19 129 QM 2061, Proj. 7 79 10 002, Tech. Rep. TS 131, March 1965, 122pp. USA Natick Labs., Natick, Mass. (AD 471324)

Protection against the blast effects of a small anti-personnel land mine is the goal of this research. One ounce of high explosive contained in such a device generally leads to traumatic amputation of a foot clad in the standard stitched or molded sole combat boot. This program is oriented toward providing some degree of protection from amputation within the framework of footwear which does not present any serious restrictions on the mobility of the individual protected. A number of protective shanks to be incorporated into the sole and heel of a direct molded sole (DMS) boot have been evaluated and a high strength aluminum honeycomb system indicated the greatest promise. The stress transmitted through this layered honeycomb system was less than one kilobar while several other systems including a hollow stainless steel shank transmitted more than one kilobar in all cases evaluated. A study of the gross impulse generated by the M-14 APERS land mine indicated that a wedge-shaped surface with a 112° included angle (3 x 6 inch projected area) produced 44% less impulse than a flat surface of the same projected area. Thus, a combination of a wedge-shaped protective shank and outsole with a layered crushable honeycomb construction appears to be the most promising form of protective system yet developed. The honeycomb material must have a high crushing strength and the steel layer forming the exterior portion of the wedge must be at least 1/16 inch thick. Experimental results indicate that the honeycomb material must be selected for an initial crushing strength ranging from 2,550 psi to 4,150 psi.

R 39

27,193

Keating, D.A., Weiswurm, K., Meyer, C.M., Filson, G.W., et al. MANNED TESTING OF A SEMI-PASSIVE POTASSIUM SUPER-OXIDE ATMOSPHERE CONTROL SYSTEM. FINAL REPORT JULY 1965. Contract AF 33(615) 1518, Proj. 6373, Task 637302, AMRL TR 65 194, Nov. 1965, 5pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio

A potassium superoxide atmosphere control system using the optimum features of passive and dynamic techniques was man-tested for 24 hours. The results demonstrate the feasibility of using a potassium superoxide system of this design for manned space missions. This semi-passive technique is applicable to short missions as well as longer missions. The findings indicate that significant weight, volume, and power savings can be obtained using the semi-passive technique as compared to dynamic techniques used in other solid chemical atmosphere control systems.

R 2

27,194

Wherry, R.J., Jr. & Curran, P.M. A STUDY OF SOME DETERMINERS OF PSYCHOLOGICAL STRESS. BuMed Proj. MFO22.03.02 5013, Subtask 14, NSAM 941, Rep. 2, July 1965, 38pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla.

This study utilizes a 4-choice discrimination task and various levels of electric shock to investigate possible determiners of anticipatory stress, and individual differences in performance decrements resulting from such stress. In general, disruption increases as the threatening event comes closer, as the perceived probability of its occurrence becomes greater, and as the perceived degree of unpleasantness is increased. Whether or not the anticipated unpleasant event really occurred in previous exposures influences behavior in subsequent exposures. There are several indications that anticipatory physical threat stress has a curvilinear relationship to performance, with low amounts of threat enhancing performance. There were wide individual differences in susceptibility to performance disruption by threat.

R 16

27,195

Ritzinger, F.R. DISEASE TRANSMISSION BY AIRCRAFT. Review 4 65, May 1965, 10pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Military Med., July 1965, 130(7), 643-647).

The control measures which have been instituted by WHO and the Pan-American Sanitary Bureau, along with the services of immunization procedures, modern methods of de-insectization and local public health measures, have been effective. However, international public health measures are only as effective as the weakest link in the chain of control. Break down can occur with inconsistencies in sanitary control and quarantine practice from one country to another, suppressed epidemiologic information because of the adverse effects on commerce, inaccurate or insufficient reporting systems, and failure of passengers to comply with existing health and quarantine regulations for international travel. Countries on a world-wide basis must cooperate in meeting the requirements of current international sanitary regulations.

R 16

27,196

Napalkov, A.V. & Chichvarina, N.A. SOVIET STUDY OF CONTROL SYSTEMS AND MAN'S HEALTH. Proj. G7 1050, FSTC 381 T64 235, June 1965, 17pp. USA Foreign Science & Technology Center, Washington, D.C. (Transl: Priroda SSSR (Russian), 1964, 12, 31-38). (AD 466082)

The important concept of algorithm is explicated in the paper. Briefly, an algorithm is defined as "the system of rules whereby it is possible to solve a specific class of problems!" Of importance is the fact that algorithms are built on the type of mutually subordinated levels. The first level is the control program, i.e., the command system which directly regulates the operation of the internal organs. The second, higher algorithm, is the system of rules and principles which itself does not control, but creates new controlling mechanisms, shapes them and corrects their operation. It is evident that this second level algorithm is of the greatest significance for health, that upon it depends the creation of controlling mechanisms that are good or bad and harmful to man. Scientists know how this or that algorithm works, what phenomena may be expected if the controlling mechanism uses this or that algorithm. That is, if an algorithmic description of the operation of the brain is given, this whole theory which scientists have at their disposal may be applied. It will then be possible to create an electronic model of the development of a disease and bring out ways of curing it thereon. In this manner, the theory of self-organizing systems permits one to come fully to grips with a solution of the cardinal questions of medicine. The possible application of this approach to cancer and several other diseases is discussed.

27,197

Carbonell, J.R., Grignetti, M.C., Stevens, K.N., Williams, C.E., et al. SPEAKER AUTHENTICATION TECHNIQUES. FINAL REPORT, 1 JUNE 1964-31 MAY 1965. Contract DA 28 043 AMC 00116(E), DA Proj. 1E6 79191 D 491 05, DA Task 1E6 79191 D 491, BBN Rep. 1296, Job 11161, Rep. 2, July 1965, 109pp. USA Electronics Labs., Fort Monmouth, N.J. (Bolt Beranek & Newman, Inc., Cambridge, Mass.). (AD 468993)

The present report describes a program designed to develop procedures for the authentication of talkers. The initial phase of the program consisted of a review of the literature and selection of suitable approaches for investigation. Following this, a series of experiments was designed to investigate aural, visual, and automatic procedures for talker authentication and identification, using a matching-from-sample technique. The visual procedures used intensity-frequency-time patterns of utterances as stimulus material. The results show that for learning periods extending over a few hours, aural identification of talkers is more reliable than identification from visual patterns. Performance also depended on length and phonetic content of the utterances, and showed considerable variation from one talker to another and from one S to another. A description is given of the hardware and software design for several stages of the studies of automatic recognition by computer. Preliminary results based on matching digitized intensity-frequency-time patterns of one speaker and of a number of different speakers over selected regions of a word indicate that a procedure of this kind has considerable potential for talker authentication and identification.

R 22

27,198

Sheridan, T.B. & Mayer, Sylvia R. DESIGN AND USE OF INFORMATION SYSTEMS FOR AUTOMATED ON-THE-JOB TRAINING. VOLUME V. FINAL REPORT. Contract AF 19(628) 455, Proj. 7682, Task 768204, ESD TDR 64 234, April 1965, 15pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Bio-Dynamics, Incorporated, Cambridge, Mass.). (AD 616545)

This report describes the results and conclusions of a study which was directed at the development of principles for the design of automated instructional subsystems for Information Systems. A series of 4 Technical Documentary Reports have been issued which describe in detail the activities and results of each aspect of the study. This report brings together and summarizes the results reported in the individual documents, and includes additional items which did not warrant separate documentation.

R 12

27,199

Seidenstein, S. & Berbert, A.G., Jr. MANUAL CONTROL OF REMOTE MANIPULATORS: EXPERIMENTS USING ANALOG SIMULATION. Report from: "Ninth Annual Meeting, Human Factors Society, 21 October 1965". 1965, 26pp. Ritchie, Incorporated, Dayton, Ohio.

An analog simulation of a remote manipulator system with 2 degrees-of-freedom in motion was developed. It was then used in a series of 3 experiments designed to investigate operator performance as a function of control mode, manipulator dynamics and task requirements. The first experiment investigated the following independent variables: a) control mode (fixed vs. proportional rate); b) maximum rates of motion (4 levels); c) 2 levels of manipulator dynamics (involving mass, damping, motor, and drive characteristics); d) target size (2 levels) or final positioning error tolerance; e) criterial time (2 levels), i.e. the duration final arm position had to be maintained once achieved; and f) distance from starting point to target (3 levels). The second experiment studied position control in place of rate control and included other variables as in Exp. 1. In the third experiment a fixed rate control permitted the operator to select at will either of 2 rates. 4 combinations of rates were used. The other variables were as in Exp. 1. Results of Exp. 1 showed significant main effects for control mode, system dynamics, and rate of movement. Increased complexity of system dynamics produced a decrement in operator control performance, which was greater for the fixed rate control. Superior overall performance was attained with the proportional rate control. The best overall performance was obtained with a rate of motion of 9.32 cm/sec. Travel time increased slightly at the highest rates of motion. Adjustment time increased linearly with increases in rate of manipulator motion. Exp. II showed superior performance with position control. Operation of the control produced an almost instantaneous change in position and permitted accurate adjustment. Exp. III revealed that a 2 level fixed rate control afforded no overall advantage in performance as compared to an optimum single level of rate control.



27,200

White, A.S. A DISCUSSION OF CREW COORDINATION IN THE XB-70A. ca. 1965, 6pp. North American Aviation, Inc., Los Angeles, Calif.

This paper is a discussion of crew coordination in the XB-70A. From his experiences the author draws the following conclusions: a) In large high speed airplanes such as the XB-70A, a crew of 3 should be the minimum for flight testing the aircraft; b) Studies should be made in order to perfect a design that will in some way tie the engine power controls to the inlet duct control so that the natural pilot reactions that have been built up for years will not compound an emergency situation; c) It would seem wise to study the XB-70A incidents carefully and consider them in setting up simulator programs for future large, high speed aircraft. More detailed simulation of the propulsion system and its characteristics would be very valuable--and economical in the long run; d) The normal type military emergency procedure checklist is not adequate. Unless the pilots have exceptionally good memories for a multitude of procedures, one that won't fail them under duress, they need a more efficient means of getting to emergency procedures checklists. Aural or visual means should be considered.

27,201

Lavender, H.J. HUMAN ENGINEERING RESOLUTION OF A QUALITY CONTROL PROBLEM: THE VIBRATION TESTING OF IMPACT DETECTORS. Report from: "Ninth Annual Meeting, Human Factors Society, 18-21 October 1965, Dayton, Ohio." 1965, 14pp. Lycoming Div., Avco Corporation, Wilmington, Mass.

Impact detectors are components installed into the nose of certain re-entry vehicles. These components undergo quality control tests prior to installation, one of these tests being the effects of certain temperature and vibration combinations. An independent laboratory performs production sample tests (PST) on these detectors although every detector is tested by Quality Control test personnel. In several cases, the test results by Q.C. personnel and the independent laboratory were incompatible by a large margin. The question arose as to the role the operator played in this apparent incompatibility. This paper is the result of an investigation of the role of the human and the possibility of human error as being a cause of different test results.

R 5

27,202

Cox, C.D. (Ed.). MAINTAINABILITY ENGINEERING GUIDE. Rep. RC S 65 2, Oct. 1965, 132pp. USA Missile Command, Redstone Arsenal, Ala. (AD 471857)

This engineering guide introduces the design engineer, the development engineer, and the development manager to the fundamental concepts of specifying, quantifying, and testing for a specific level of maintainability, with particular application to Army missile weapons and equipment. Covered in the guide are the fundamental mathematical concepts associated with maintainability, design guidelines to enhance maintainability, the major program requirements, and demonstration techniques. More specifically, a practical method is formulated and presented for applying the fundamental engineering and statistical techniques associated with the technology of maintainability. The techniques presented here were chosen from among several alternates. "Maintainability Engineering Guide" was selected as the title because the discussion is directed primarily toward engineering personnel; however, "Maintainability Management Guide" would be equally appropriate since a large portion of its contents pertains to program management.

R 26

27,203

Lampkin, B.A. & Randle, R.J. INVESTIGATION OF A MANUAL SEXTANT-SIGHTING TASK IN THE AMES MIDCOURSE NAVIGATION AND GUIDANCE SIMULATOR. NASA TN D 2844, May 1965, 37pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.)

The Ames Midcourse Navigation and Guidance Simulator has been used for defining problem areas associated with sextant sightings in a space navigation scheme, and for determining the relative accuracy of sextant sightings taken with a hand-held sextant and with a gimbaled sextant. Sightings of this type would be used for determining the trajectory of a translunar or an interplanetary vehicle. The data indicate that, while the sextants used in this investigation require refining, they could probably be incorporated into a space navigation system. While the gimbaled sextant was slightly favored over the hand-held sextant, the hand-held sextant provided nominally as accurate sighting data as did the gimbaled sextant. Within the limitations of this study there was little effect of vehicle rotational motion about a single axis on sighting repeatability.

R 4

27,204

Kurkowski, R.L. & Grover, K.C. SECOND-ORDER PERTURBATION ANGLE TECHNIQUES FOR ACCURATELY SIMULATING SIGHTING PROBLEMS OF A SPACE SEXTANT. NASA TN D 2843, May 1965, 63pp. National Aeronautics & Space Administration, Washington, D.C. (Ames Research Center, NASA, Moffett Field, Calif.)

The performance of a vehicle-mounted servo-operated space sextant has been investigated with a fixed-cockpit analog-computer simulation. Computational accuracy of 1 arcsec was obtained with second-order perturbation angle techniques on the analog computer. A detailed description of the mathematical derivation is presented. Some typical results are included. The over-all system, which incorporated a cathode ray tube display, had an accuracy level of  $\pm 2$  arcsec with a man in the loop and no vehicle or target motion. The effects of target and vehicle motion were studied and indications were that for 3 $\sigma$  sighting accuracies of  $\pm 10$  arcsec or less rates must be less than 200 arcsec/sec. Optical characteristics of the sextant were X27 and 1.8° field of view.

R 3

27,205

Bergeron, H.P., Kincaid, J.K. & Adams, J.J. MEASURED HUMAN TRANSFER FUNCTIONS IN SIMULATED SINGLE-DEGREE-OF-FREEDOM NONLINEAR CONTROL SYSTEMS. NASA TN D 2569, Jan. 1965, 42pp. National Aeronautics & Space Administration, Washington, D.C. (Langley Research Center, NASA, Langley Station, Va.).

Tests have been made to determine the variations in the transfer function of human pilots in simulated single-degree-of-freedom tasks due to various nonlinearities introduced into the pilot control system. The Ss included test pilots and engineers. The results show that variations in the measured gains did not occur in direct proportion to the variations made in the nonlinearities. An abrupt change did occur, however, in the measured gains of 2 of the pilots at low saturated control torques. The measured data from the single-axis tests were applied to a multi-loop problem. The results for this problem confirm the feasibility of this procedure.

R 5

27,206

Blair, W. MANUAL SPACE NAVIGATION COMPUTER PROGRAM. Contract NAS 2 1477, NASA CR 250, July 1965, 125pp. National Aeronautics & Space Administration, Washington, D.C. (American Bosch Arma Corporation, Garden City, N.Y.).

This report describes and evaluates the design and use of a simple manual space navigation computer. This computer is intended to provide backup guidance capability under abort conditions during an advanced manned space mission. A design study with an evaluation of the accuracy of the various components used in the computer is presented. A detailed accuracy analysis has been performed by simulation techniques. The overall accuracy of the manual space navigation computer is presented showing the results of the study for various abort trajectories. Significant relationships between accuracy and the operational usage of the manual computer have been developed.

27,207

Gagliardi, U.O. TWO EXTENSIONS OF STATISTICAL DECISION THEORY. FINAL REPORT. Contract AF 19(628) 4303, Proj. 4690, ESD TDR 65 216, Jan 1965, 30pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Dunlap & Associates, Inc., Darien, Conn.).

The objective of the project was to develop broader formulations of the mathematical (statistical) theory of decisions. This final report presents 2 broad scope generalizations which have resulted from this project. The first generalization discussed is a decision-making model which applies to the case of a not-well-informed decision maker with independent data sources. In this model, the inference about the prior distribution is determined from the solution of an adjunct decision problem, which specifies the minimum risk hypothesis in the light of the available information. The second generalization presented is a model of multi-period decision making for both stationary and Markovian environments. In contrast to the model discussed in the above paragraph, this model does not assume independent data sources, i.e., that the observation processes are not affected by the actions of the decision maker.

R 2

27,208

Steubing, H.G. INTEGRATION OF ELECTRORETINOGRAM OVER TWO TIME INTERVALS. Proj. WepTask RAE13C005/2001/R0050101, P.A. 005AE13 24, NADC AC 6502, April 1965, 48pp. USN Air Development Center, Johnsville, Penn. (AD 464008)

A technique for performing integrations over short duration signals is presented in this report. ERGs were measured and recorded on magnetic tape at the Aerospace Crew Equipment Laboratory. Hybrid computer equipment was utilized to process the data at the Naval Air Development Center.

R 2

27,209

Emery, J.H. & Dougherty, D.J. CONTACT ANALOG SIMULATOR EVALUATIONS: THE INFLUENCE OF SCREEN SIZE AND IMAGE FIELD OF VIEW. Contract Nonr 1670(00), JANAIR Tech. Rep. D228 421 021, April 1965, 27pp. Bell Helicopter Company, Bell Aerospace Corporation, Fort Worth, Tex.

Measurement was made of the ability of 4 groups of pilots to perform a simulated rotary wing approach task under 4 display conditions of screen size and image field of view on the JANAIR contact analog vertical display. 2 screen sizes tested were 6 in. square and 12 in. square. Each was tested at a viewing distance which yielded visual angles of 15° and 30°, respectively. 2 image fields of view, 30° and 60°, were each tested with the 2 screen sizes. 5 pilots were randomly assigned to each of the 4 test conditions. Measures of glideslope altitude, lateral track and airspeed control were recorded during the descent of the approach task. Flare overshoot, impact "G" and final touchdown position were measured during the landing. Results indicate that image field of view did not differentially affect any of the 6 performance measures. Approach airspeed control was significantly better with the 12 in square screen. Final touchdown position control was superior on the 6 in square screen. None of the remaining performance measures were differentially affected by screen size. It was concluded that pilot Ss with no previous training on the contact analog could adapt to the display condition that each was assigned, but it is recommended that a 1:1 relationship with the real world be used if intermittent VFR-IFR flight were in force or if it were desirable to superposition other information such as television or radar on the contact analog.

R 4

27,210

Curtin, J.G., Dougherty, D.J. & Emery, J.H. EVALUATION OF THE RH 2 COCKPIT MOCK-UP. Contract Nonr 4429(00), JANAIR Tech. Rep. D228 410 001, Aug. 1965, 61pp. Bell Helicopter Company, Fort Worth, Tex.

This study represents one in a series of evaluations of the JANAIR concept of an IFR flight display system. The purpose of this experiment was to determine the feasibility of the cockpit layout and sub-panel design in terms of accessibility, operability in real time, the effect of training, and the performance of the required procedures. A concurrent objective was to examine means of improving the tested design. Testing was performed in a mock-up of the JANAIR Research Helicopter Number Two (RH-2) located at Bell Helicopter Company's Flight Simulation Laboratory. 5 S pilots learned and performed procedures for all flight test maneuvers. The procedures encompassed all manipulatory tasks to be performed throughout the simulated flight. Performance measures taken included: number of errors committed and time required to perform the procedures. Summary analyses of the findings indicate: a) the time allowed to perform the required procedures is realistic and sufficient so as to preclude overburdening a single operator in flight; b) some control knobs and selectors were inconveniently located on the right side of the panel; and c) minor revisions were indicated to optimize procedures performance. The significance of the results is discussed and recommendations for optimum control design are noted.

R 12

27,211

Bailey, R.W. COLOR VISION DEFICIENCIES IN ARMY FLIERS. DA Proj. DaO 2560 IA 819, USAARU Rep. 65 2, April 1965, 17pp. USA Aeromedical Research Unit, Fort Rucker, Ala. (AD 462860)

Normal color vision has historically been an intrinsic part of the physical standards maintained for military and civilian aviators and aircrew members. This a priori requirement has not been challenged due to the abundant number of applicants vs the number such positions available. There is no longer a surplus of such personnel. In view of the percentage of the male population affected by imperfect color vision, this standard contributes significantly to the number of applicants rejected. An easement in this standard could be immediately converted to a larger number of otherwise qualified applicants. This paper deals with a review of some color tests and a testing procedure employed to determine the number of color anomalous fliers in Army aviation. Data collected indicate that this requirement may be unnecessary and that a new philosophical approach is long overdue.

R 17

27,212

Mikelonis, E.C., Shearer, R.P. & Duguay, Gretchen L. PRELIMINARY INFRARED FIRE MAPPING SYSTEMS ANALYSIS. FINAL REPORT AUGUST 1964-NOVEMBER 1965. Contract OCD PS 65 6, Proj. 2522D, Rep. 75011 F, Nov. 1965, 209pp. US Office of Civil Defense, Department of the Army, Washington, D.C. (HRB-Singer, Incorporated, State College, Penn.).

An analysis is presented of the factors affecting operational use of a postattack IR fire mapping system. Organizations that could support such an operation were determined. Based upon the employment of a specific number of IR units, the time to map all areas of interest was calculated. A "threat indifference" approach was employed to determine the areas of interest. A training program is presented for both system operators and technical personnel. Many potential peacetime applications of the system were defined. A cost analysis of the various system configurations is also given.

R 64

27,213

Hollender, H.A. & Klicks, Mary. DEVELOPMENT OF DEHYDRATED AND BITE-SIZED FOOD ITEMS. FINAL REPORT MARCH 1963-MARCH 1964. Contract MIPR AM 3 40007, Proj. 7164, Task 716405, AMRL TR 65 160, Dec. 1965, 112pp. USAF Medical Research Labs., Wright-Patterson AFB, Ohio. (USA Natick Labs., Food Div., Natick, Mass.).

Prolonged aerospace missions necessitate severe restrictions on the weight and size of all material carried on board the space vehicle. These limitations must be applied to the astronauts' food, as well. Therefore to meet these restrictions and to provide optimum nutrition, the US Army Natick Laboratories (NLABS) developed, evaluated, and supplied a variety of prototype dehydrated and bite-sized foods to the Aerospace Medical Research Laboratories for further evaluation. The formulations and production guides for each food item are included. Pillsbury developed various dessert bite-sized food pieces as well as a good food coating for encapsulating the food cubes for use in aerospace systems. Compressed 0.75 in. cubes with rounded corners and edges were suggested for aerospace missions. The encapsulation process employed 2 immiscible systems, a film former in the continuous phase surrounding a liquid, or once liquid, discontinuous phase, and a plasticizer to form the stable dispersion. The stable dispersion when applied to the dessert bits adhered tenaciously and then air dried to a smooth, nonsticky, moisture resistant, and oxygen resistant coating. The best coating formula consisted of 45% melted lard, 9% sodium caseinate, 2% gelatin, 3% cornstarch, 41% sucrose, and 100 ml water. On the basis of taste panel evaluations of these foods, an acceptable, nutritious 3-day menu cycle with 4 meals per day can be recommended for aerospace missions. The menu supplied 2500 kcal per day, of which 48.6% of the energy was supplied by carbohydrates, 32.7% by fat, and 18.7% by protein.

27,214

Honigfeld, Alfreda R. GROUP BEHAVIOR IN CONFINEMENT: REVIEW AND ANNOTATED BIBLIOGRAPHY. AMCMS Code 5026.11.81900, Tech. Memo. 14 65, Oct. 1965, 114pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

Field and laboratory confinement studies were reviewed to evaluate existing information and to identify areas where future research is needed. The studies reviewed deal with confining 2 or more people in a restricted space for a prolonged period of time: particular attention was devoted to how such conditions degrade performance. Few of the studies bear on the Army's chief interest in confinement: how men will perform during and after prolonged confinement in armored vehicles. The review concludes by recommending ways to make future studies of confinement more directly relevant to the Army's interest.

R 63

27,215

Custance, A.C. THE RELATIONSHIP BETWEEN TREADMILL CHAMBER EXERCISES AND FIELD EXERCISES UNDER COMPARABLE CONDITIONS. PART I. LIGHT CLOTHING SYSTEM. Rep. 451, Feb. 1965, 33pp. Defence Chemical Biological & Radiation Labs., Defence Research Board, Ottawa, Ontario, Canada.

Using 9 Ss each of whom walked over 300 miles during the summer months and in all kinds of weather, a comparison was made on the basis of the measurement of energy cost, sweat loss, and rectal temperature, between field and chamber (treadmill) exercises performed under comparable conditions. It was found that for a light clothing system, moderate work rate, and temperate environment, treadmill exercise at a given Wet Bulb Temperature indoors, is equivalent to the same exercise out-of-doors performed on a level gravel and paved road at the same temperature read as a Wet Bulb Globe Temperature.

R 47

27,216

Ferguson, G.A. HUMAN ABILITIES. Ann. Rev. Psychol., 1965, 16, 39-62. (McGill University, Montreal, Quebec, Canada).

This review of individual differences in aptitude excludes literature on methodologies used in the study of human abilities. General theories are discussed, including those of Hunt and Cattell. The revival of interest in behavioral genetics is pointed up by the inclusion of studies on the role of heredity in human ability. Other topics covered are a) the development of abilities; b) organization or structure of abilities; c) the relation between ability and learning; d) ethnic comparisons; and e) aging factors. (HEIAS)

R 142

27,217

Blough, D.S. & Millward, R.B. LEARNING: OPERANT CONDITIONING AND VERBAL LEARNING. Ann. Rev. Psychol., 1965, 16, 63-94. (Walter S. Hunter Psychology Lab., Brown University, Providence, R.I.).

This review on the topic of learning is divided into 2 independent sections. The first is operant conditioning, which includes those studies which measure the rate or relative frequency of a freely repeatable response. The subtopics of reinforcement and stimulus control are handled in some detail. The section on verbal learning is divided into 3 parts. The first concerns the role of mathematical psychology, computer simulation, and cognitive theory in verbal learning. The second emphasizes problems with, and solutions to, the definition of a stimulus. The third part mentions briefly some of the theoretical issues which have been raised in various rate-learning procedures. (HEIAS)

R 247

27,218

Twedt, D.W. CONSUMER PSYCHOLOGY. Ann. Rev., Psychol., 1965, 16, 265-294. (Oscar Mayer & Company, Madison, Wisc.).

This review is divided into 8 sections: a) a brief description of the various disciplines involved in what is called consumer psychology; b) an overview of the consumer psychologist and his activities; c) a discussion of the increasing formalization of the field; d) consideration of the major social changes that are affecting both consumers and consumer psychologists; e) the implications of electronic data processing for consumer psychology; f) buying behavior; and g) outlook on the future. (HEIAS)

R 178

27,219

Biesheuvel, S. PERSONNEL SELECTION. Ann. Rev. Psychol., 1965, 16, 295-324. (South African Breweries Limited, Johannesburg, South Africa).

Personnel selection is reviewed here under the following topical headings: a) selection and validation models; b) the criterion problem; c) personality measurement; d) holistic approaches; and e) selection in developing countries. Personnel selection is only one element in a complex system of manpower utilization, and neither its requirements nor its success can be properly appraised without taking the other elements that determine the functioning of the system into account. (HEIAS)

R 150

27,220

Thurlow, W.R. AUDITION. Ann. Rev. Psychol., 1965, 16, 325-358. (University of Wisconsin, Madison, Wisc.).

This extensive survey of the literature in the area of audition is organized as follows: signal detection studies, discrimination of frequency and intensity change, speech perception, masking, pitch, loudness, annoyance, perceptions related to quality, temporal discriminations, temporary threshold shift, localization, and several sections on the anatomy and physiology of the ear. (HEIAS)

R 273

27,221

Westheimer, G. VISUAL ACUITY. Ann. Rev. Psychol., 1965, 16, 359-380. (Neurosensory Lab., University of California School of Optometry, Berkeley, Calif.).

This review of literature about the spatial resolving capacity of the visual system starts off with a discussion of theory, proceeds to tests of visual acuity, factors influencing visual acuity, comparative studies, and Fourier theory and resolution. (HEIAS)

R 245

27,222

Benjamin, R.M., Halpern, B.P., Moulton, D.G. & Mozell, M.M. THE CHEMICAL SENSES. Ann. Rev. Psychol., 1965, 16, 381-416. (University of Wisconsin, Madison, Wisc.).

Taste and smell are handled in this review of the chemical senses. For taste, the authors consider papers on the anatomy of the taste buds, anatomy of the different nerves, receptor events, peripheral encoding of stimulus quality, species differences, internal chemoreception, taste mediated behavior, and central nervous system components. For olfaction, the order of discussion is the electro-olfactogram, unit activity in the olfactory mucosa, spatio-temporal patterning, electrophysiology, comparative studies, odor theories, psychophysics, and, finally, olfactometers. (HEIAS)

R 230

27,223

Chown, Sheila M. & Heron, A. PSYCHOLOGICAL ASPECTS OF AGEING IN MAN. Ann. Rev. Psychol., 1965, 16, 417-450. (Bedford College, University of London, London, England & Rhodes-Livingstone Institute, Lusaka, N. Rhodesia).

This review of gerontology covers attitudes toward aging, attitudes toward death, attitude changes with age, personality changes, and psychophysical changes in taste, vision, hearing, etc. Motor performance (reaction time and movement times) is considered, as well as intellectual performance. Finally, industrial studies and those relating to changes in life pattern are presented. (HEIAS)

R 252

27,224

Ekman, Gosta & Sjöberg, Lennart. SCALING. Ann. Rev. Psychol., 1965, 16, 451-474. (Psychological Labs., University of Stockholm, Stockholm, Sweden).

This review surveys the literature on psychological scaling methods up to May, 1964. A brief discussion is given on the following general problems: a) what is measured; b) the concept of choice; c) choice experiments; and d) Luce's principle. A detailed description follows on the 2 main types of scaling, the Thurstonian or indirect methods, and the estimation methods, primarily founded by the work of S. S. Stevens. Comparative studies are cited, involving different scaling methods applied to the same continuum and the same Ss. Multidimensional methods may be classified in the same way as the unidimensional methods. The power law has replaced Fechner's logarithmic law, but the fact that it is always verified by the direct ratio estimation methods, lays it open to criticism. Ekman suggested that the power law was a special case of Fechner's law. This question may not be settled within the framework of scaling theory. (HEIAS)

R 124

27,225

Lumsdaine, A.A. & May, M.A. MASS COMMUNICATION AND EDUCATIONAL MEDIA. Ann. Rev. Psychol., 1965, 16, 475-534. (University of California, Los Angeles, Calif. & Yale University, New Haven, Conn.).

This review deals primarily with the audio-visual media of communication and instruction. Background papers are presented first. These are followed by discussion of the rise and effects of broadcast media and educational media. Various evaluative studies of media program effects are next and experimental investigations of instructional variables are presented also. (HEIAS)

R 407

27,226

Dileonardo, G. & Johnson, R.W. BASE CONSTRUCTION ON OTHER WORLDS. Report from: "Advances in Space Science & Technology, Volume 7." 1965, 215-271. Academic Press, New York, N.Y. (General Electric Company, Philadelphia, Penn.).

An extraterrestrial base is a manned facility assembled on any of the many bodies of the solar system. In this article, various phases in the construction of bases are considered. A philosophy relating to adequate protection of man and his technological systems is defined. Following this, shelter and protective construction is discussed. Then there are sections on transportation systems, utilities development, energy management, life support, and construction methods and techniques. (HEIAS)

R 58

27,227

Kast, F.E. & Rosenzweig, J.E. ORGANIZATION AND MANAGEMENT OF SPACE PROGRAMS. Report from: "Advances in Space Science & Technology, Volume 7." 1965, 273-364. Academic Press, New York, N.Y. (Business Administration College, University of Washington, Seattle, Wash.).

The task of organization and management confronting NASA is the subject of this article. A broad background and conceptual framework is presented first, followed by discussion of specific programs and technical matters. (HEIAS)

R 24

27,228

Ledbetter, J.O. & Randall, C.W. BACTERIAL EMISSIONS FROM ACTIVATED SLUDGE UNITS. Indust. Med. Surg., Feb. 1965, 34(2), 130-133. (University of Texas, Austin, Tex.).

The airborne bacterial counts made on 35 different days exhibit conclusive evidence that the bacterial population of air is increased by passage over an activated sludge waste treatment unit. Despite a rapid die-off of bacteria, an increase in the bacterial population persists for a considerable distance and time. The distance is strongly dependent upon wind velocity. No effects of relative humidity and temperature could be noted in this study. The investigation is continuing with future plans to identify serotypes in an effort to evaluate the health hazard involved.

R 17

27,229

Randolph, T.G. CLINICAL MANIFESTATIONS OF INDIVIDUAL SUSCEPTIBILITY TO INSECTICIDES AND RELATED MATERIALS. Indust. Med. Surg., Feb. 1965, 34(2), 134-142. (Human Ecology Research Foundation, Chicago, Ill.).

Merely to determine the toxicity of a given substance by the means ordinarily employed is insufficient, inasmuch as the impact of this so-called safe exposure may be so potentiated in a highly susceptible individual as to manifest in a wide range of illnesses. The chronic (adapted and partially adapted) and acute (non-adapted) stages of these physical and mental reactions, and how these stages and levels of response may be changed as a result of environmental control have been described. Since maladaptation to multiple exposures is to be expected, management of these cases entails a knowledge of the total environment demonstrated to be impinging on such susceptible persons. Both the reliability of present techniques employed by toxicologists in determining the safety of lesser doses of materials known to be toxic to humans in greater concentrations and the distinctions alleged to exist between reactions on the basis of toxicity and on the basis of individual susceptibility are to be questioned.

R 23

27,230

Gifford, R.H. & Dauer, M. THE ROLE OF THE SOUTHERN INTERSTATE NUCLEAR BOARD IN RADIATION PROTECTION. Indust. Med. Surg., Feb. 1965, 34(2), 147-150. (Southern Interstate Nuclear Board, Atlanta, Ga. & Radiology Dept., University of Miami School of Medicine, Coral Gables, Fla.).

The Southern Interstate Nuclear Board (SINB) serves as a clearing house for information in the nuclear energy field and has sponsored conferences and symposia in such areas as science writing, technical manpower requirements, insurance and tort liability, as well as agriculture, technology utilization, medicine, public health and related fields. Through the impetus of this Board, there have been developed more state nuclear committees or commissions in the South than in any other section of the country. The region also has witnessed a number of significant firsts. Among these are the first state nuclear development program in the nation, the first state space legislation, the first law linking the atom and space in a single administrative program, the first ports cleared for handling radioactive materials, including spent reactor fuels from abroad. The South is also the site of the first campus reactor, the first state to obtain licensing and inspection authority from the AEC over radioactive material, and the nation's first junior college nuclear reactor program.

27,231

Van Raalte, H.G.S. COMPARATIVE HAZARDS FROM SOME INSECTICIDES. Indust. Med. Surg., Feb. 1965, 34(2), 160-162. (Shell International Research Mij., N.V., Hague, The Netherlands).

The estimate of comparative potential long-term hazards based on the current use-pattern is in agreement with that based on actual residues found in human fat. The results are also in agreement with the various persistencies of these insecticides in the soil. Thus it appears that of the organochlorine insecticides, DDT presents the greatest potential long-term hazard. Toxicologists agree that this hazard is practically negligible. In decreasing order of presenting a potential long-term hazard are toxaphene, dieldrin, endrine, BHC.

R 41

27,232

Hermann, E.R. A BIO-PHYSICAL LAW DESCRIBING HEARING LOSS. Indust. Med. Surg., March 1965, 34(3), 223-228. (Northwestern University, Evanston, Ill.).

A mathematical formulation of the fundamental manner in which human hearing deteriorates with continuation of excessive noise exposure is presented. A general law is stated: The rate at which noise-induced hearing loss is experienced is proportional to the amount of hearing remaining to be lost. This law is well supported by audiometric data obtained from pure-tone threshold responses at 4000 cps. The conclusion that the detrimental effect of noise on human hearing follows a first-order, first-degree differential equation has broad implications. A bio-physical explanation of how hearing losses occur is suggested. The study indicates areas of research in the fields of anatomy, audiology, physiology and statistics that should prove fruitful in understanding the mechanism(s) of noise-induced hearing loss.

R 5

27,233

Schulman, M. THE FUTURE OF HEALTH IN INDUSTRY. Indust. Med. Surg., March 1965, 34(3), 234-239. (Health Sciences Center, University of California, Los Angeles, Calif.).

With all of its complexities, industry is constantly changing; medicine, also undergoing change, is finding greater use for bioengineering techniques and is growing more complex. In terribly inadequate numbers, new occupational physicians are being trained to cope with the challenging interplay of medicine and industry, and at stake is the health of millions of working people. The need for more specialists in occupational medicine is truly tremendous. What occupational medicine must develop is an intensive public relations program, a continuing, hard-hitting and progressive program that not only will correct misconceptions about the specialty but will also stress whatever is necessary to attract new recruits.

R 45

27,234

Levinson, H. THE FUTURE OF HEALTH IN INDUSTRY. Indust. Med. Surg., April 1965, 34(4), 321-327, 330-334. (Menninger Foundation, Topeka, Kan.).

There is a growing body of evidence about the importance of the man-organization relationship, and about the implications of this relationship for symptomatology, about modes of intervention to alter the stressful aspects of the relationship and reduce symptomatology. We are therefore at the threshold of an era in which the occupational physician will learn to diagnose and treat organizational stress as his major preventive effort. Thus he will have the opportunity to bring public health concepts of prevention into his everyday practice in areas so far immune to such thinking and action. If the future of health in industry promises anything, it promises a closer approximation to affecting the health of the total man. To prepare himself for this more comprehensive role, the occupational physician will have to broaden his conception of his function, the range of his observations and his understanding of the causes of illness. He will have to learn new concepts, perspectives and techniques which will enable him to use the data of other specialized disciplines rather than perceive them as competitors. He will have to reject some short term solutions, such as palliative treatment, in those instances where concentration on forces precipitating illness is required. And in order to deal with some of the more important precipitants of illness he will have to consult more consistently with management toward the achievement of long-range goals. These are the paths of future of health in industry.

R 40

27,235

Fuqua, P.A. PLUTONIUM ABSORPTION--EVALUATION AND TREATMENT. Indust. Med. Surg., April 1965, 34(4), 335-337. (Hanford Atomic Products Operation, Richland, Wash.).

The radiotoxicity of plutonium is such that we work toward as near zero retention and absorption of plutonium in the body as possible. Our most common known absorption source is from contaminated wounds. We most commonly treat these wounds by early excision of the entire wound. When surgical removal is not possible, or is ineffective, it would be highly desirable to increase chemically the absorption and translocation of plutonium from the injection site. Ideally the plutonium would be bound in the most excretable form and rapidly removed from the body by a chelating agent more effective than DTPA. Presently, absorption sites not surgically accessible either receive no treatment or are treated with intravenous DTPA. Some of the most urgent diagnostic and evaluation needs have been described which would facilitate treatment. While much progress has been made in the evaluation and treatment of plutonium absorption, many unknowns remain which require solution for more effective treatment.

R 14

27,236

Bloomfield, J.J. THE OCCUPATIONAL HEALTH ACTIVITIES OF THE PAN AMERICAN HEALTH ORGANIZATION. Indust. Med. Surg., April 1965, 34(4), 338-342. (Pan American Health Organization/Western Hemisphere, Washington, D.C.).

The fundamental objective of the Pan American Health Organization is to promote and coordinate all the forces of the Western Hemisphere nations in an effort to overcome disease, prolong life and improve the physical and mental welfare of their inhabitants. In an effort to achieve this objective, the organization collaborates with member governments in the development and improvement of health services at the national and local level, provides technical consultation, grants study fellowships, organizes seminars and training courses, coordinates the activities of neighboring countries with common public health problems, compiles and distributes epidemiologic information and health statistics and carries out similar and related functions. Until a few years ago, the organization operated a rather limited program in occupational health. However, in view of the recent explosion in industrial development and the health problems which such industrialization carries in its wake, the organization has expanded its activities in this field in order to meet the growing demand for technical and financial assistance on the part of its member states.

27,237

Imbus, H.R. THE FUTURE OF HEALTH IN INDUSTRY. Indust. Med. Surg., April 1965, 34(4), 343-347. (Marian, Ohio).

The future will bring significant advances to industrial health through research and improvement of existing in-plant programs. It will bring highly sophisticated new programs to meet the needs of a changing technology. But will it bring the benefits of occupational health to the majority of workers? Upon the affirmative answer to this question depends the future of health in industry. The great failure of occupational health relates to medical services in small industrial establishments. Yet the majority of employed persons work in small and medium sized industries. We must bring the benefits of occupational health services to these industries.

27,238

Lumio, J.S. NOISE AND HEARING ABILITY: THE INCIDENCE OF HEARING DEFECTS INDUCED BY NOISE IN FINLAND. Indust. Med. Surg., May 1965, 34(5), 404-406. (Occupational Health Institute, Helsinki, Finland).

On the initiative of the Institute of Occupational Health, Helsinki, Finland, an examination has been made of 10,394 persons, at their worksites and engaged in work amid noisy surroundings. These people were subjected to tests for hearing for whisper and screening audiometer examinations, using a level of 15 db (in exceptional cases, where an examination room was not available, 20 db). Everyone whose hearing was below this level was carefully examined by audiometers; the audiometers were calibrated in accordance with the NBS standard. The anamnestic information, especially as regards earlier ear diseases and injuries, together with the exposure to noise, was carefully elucidated. In appraisal of the results of the investigation, the patients were divided, in accordance with the stage of seriousness, in 4 groups, I to IV, of which Group I comprised persons with normal hearing and Group IV those whose sum of deficiency for frequencies 500-1000-2000 cps exceeded 50 db. The following conclusions can be drawn from the findings: a) The fields of industry in Finland where the noise is most dangerous to hearing are the metal industry, weaving and paper-making. Forest work (motor saws) does not come within the scope of this investigation; b) Completely normal hearing, Group I, was found with respect to 31% in the mining industry, 27% in paper-making, and 20% in the metal industry; c) The greatest number of the more serious types of hearing defect (Group IV) is observable in the metal industry, 31%, paper-making being 26%, weaving, 23%, and mining, 21%; d) Of those with the more serious types of hearing defect, Group IV, noise was the most likely cause to the extent of 43% in the metal industry, 31% in weaving, 29% in mining, and 23% in paper-making; e) Serious hearing defects (average of hearing deficiency at 500-1000-2000 cps at least 50 db for the better ear) occurred principally in the metal and mining industries.

27,239

Gray, Jean W. MENTAL HEALTH IN INDUSTRY--NURSES ARE THERE. Indust. Med. Surg., May 1965, 34(5), 413-416. (Occupational Health Div., US Public Health Service, Washington, D.C.).

This discussion has presented 3 points about the role of nurses in mental health in industry. First, need for mental health services in industry is far greater than manpower resources to meet it; therefore, means must be devised to increase utilization and effectiveness of resources and persons on the scene. Secondly, employees who have problems and needs of a mental health nature are seen first by nurses in industrial health units, but it is not known to what extent or how effectively these workers' needs are met. And finally, with continuing consultation and guidance with psychiatric and mental health practitioners and through training and self-directed study nurses can become an increasingly important force in promotion of mental health and prevention and relief of mental illness among workers. Regarding the latter, means must be found to increase training opportunities in mental health for occupational health nurses, and the onus falls on people in the field. Meanwhile, nurses themselves are urged to plan their own programs of self-directed study in order to be counted as professional contributors to the field.

R 5

27,240

Lowry, J.H. EXPERIENCES IN DISASTER MEDICAL TRAINING. Indust. Med. Surg., June 1965, 34(6), 505-507. (Medical-Hospital Div., Milwaukee County Civil Defense, Milwaukee, Wisc.).

The problem of training personnel in disaster medicine has increased in importance since the advent of the atomic era. Milwaukee has developed a sound and effective program which stresses: a) care of shock, fractures, airway obstructions, and burns; b) sorting and priority; and c) chemical and biological weapons and the radiation syndrome. Various training aids are employed. (HEIAS)

27,241

Ebling, P.R. & Hughes, J.P. AN EPIDEMIOLOGIC APPROACH TO IN-PLANT NOISE PROBLEMS. Indust. Med. Surg., June 1965, 34(6), 508-512. (Kaiser Jeep Corporation, Toledo, Ohio & Kaiser Aluminum & Chemical Corp., Oakland, Calif.).

For an audiometric test program to be of greatest value in the prevention of hearing loss due to noise, it should aim at the earliest possible detection of noise effects. It appears that the epidemiologic analysis of audiograms obtained on men working in different areas of an industrial plant enables such early detection of excessive noise exposure. The audiograms obtained as part of a first round of health examinations among workers in a plant that had operated for some 15 yr. were analyzed statistically and found to show that M hearing acuity varied significantly among departments with different degrees of noise exposure. Such epidemiologic methods are suitable for use by the physician in even a small plant to detect early hearing loss due to noise, and additional follow-up can then be made to study and correct noise levels or to provide personal protection.

R 10

27,242

Teisinger, J. RESEARCH INSTITUTES OF INDUSTRIAL MEDICINE IN CZECHOSLOVAKIA. Indust. Med. Surg., July 1965, 34(7), 552-554. (Industrial Hygiene & Occupational Diseases Institute, Prague, Czechoslovakia).

In the year 1952 the Ministry of Health established a new Research Institute of Industrial Hygiene and Occupational Diseases in Prague. Since this time the Institute has undergone a rapid development. The scheme of organization is based on 4 departments: physiology of labor, industrial hygiene, occupational diseases, and ionizing radiation. Each department is then divided into a number of laboratories which are enumerated in the report. Several of the major research projects undertaken by the Institute are briefly reported. In addition to research, the Institute cooperates in a number of other projects. In each of the 11 regions of Czechoslovakia there is established a department of industrial hygiene attached to the regional hygienic-epidemiologic station and a department of occupational diseases attached to the regional health center. The Institute also has a share in the postgraduate training of industrial hygienists or specialists for occupational diseases. All expenses connected with the activity of the Institute are covered by the state, and all services offered by the Institute are free of charge. (HEIAS)

27,243

Patterson, H.M. GRIP MEASUREMENTS AS A PART OF THE PRE-PLACEMENT EVALUATION. Indust. Med. Surg., July 1965, 34(7), 555-557. (General Motors Corporation, Fremont, Calif.).

The preplacement evaluation should include grip measurements, a record of which is the major hand and a detailed history of any hand or upper extremity injury. The premise "grip in major hand equals grip in minor hand plus 10%" is so inaccurate it should be discarded. The fairest means of determining grip loss following a specific injury is to use the ratio of the grip in major hand compared to that in the minor hand prior to the injury and by using this formula determine what the grip in the injured hand should be, the difference being the actual grip loss. The dynamometer used should be the one preferred by your State Industrial Accident Commission. We feel that the Jamar dynamometer is the best available instrument.

R 1

27, 244

Klerman, Lorraine V. HEALTH EDUCATION IN INDUSTRY: POTENTIAL AND PRACTICE. Indust. Med. Surg., July 1965, 34(7), 563-570. (Florence Heller Graduate School, Brandeis University, Waltham, Mass.).

413 blue collar and clerical workers in 8 industrial plants with a wide range of health programs were interviewed to determine their contact with various plant health educational programs and the impact of such programs on their level of health information. The findings were: a) 22% of the respondents in plants with nurses on duty had sought advice on personal medical problems in the plant clinic. An additional 47% (of this same group of respondents) said they would consider visiting the clinic for such a purpose; b) 65% of the respondents in the plants which provided pamphlets as compared to 45% in the plants without this service stated that they read pamphlets frequently or occasionally; c) 47% of the respondents recalled seeing a health poster in the plant and most of these could remember the subject of the poster; d) 68% of the women attended the showing of the film "Breast Self-Examination" in the 2 plants in which it was shown. Very few women had attended a community showing; e) The respondents in the plants with health education programs on tuberculosis were more likely to score high on tuberculosis questions than were those in plants without such programs. This study indicates that an improvement in methods is necessary if health education is to realize its potential role in industry. A few suggestions are briefly offered.

R 13

27,245

Black, C.J. CONTACT LENSES AND THE RAILROAD INDUSTRY. Indust. Med. Surg., Aug. 1965, 34(8), 632-635. (Elmhurst, Ill.).

There is at present some confusion as to the procedure of fitting and the design and care of the contact lens. There is the problem of the change in shape of the cornea resulting in an inability to use spectacles in conjunction with contact lenses, particularly in cases of emergency. Corneal contact lenses are prohibitive in certain dusty environments. They also may not produce as good visual acuity as spectacles, and lastly they do cause moments of discomfort no matter how many years the lenses have been worn. They have utility in that they can be substituted for spectacles, and in so doing may be of aid to morale. Only in special eye problems, such as keratoconus and aphakia, do they have more value than spectacles, and then only if the vocation is suitable.



27,246

Leckey, R.G. THE INDUSTRIAL HEALTH DEPARTMENT: ONE OBJECTIVE AND ITS ACHIEVEMENT. Indust. Med. Surg., Sept. 1965, 34(9), 695-699. (Massey, Ferguson Ltd., Toronto, Ontario, Canada).

The industrial health objective discussed in this article is termed "bridging the gap." The gap is one of understanding and refers to that discrepancy which exists between the concept management holds of the employee and his health and that held by the family doctor of the patient and his work. The general views of management and of the family physician are described with emphasis upon the misconceptions each holds concerning the other. The following suggestions are offered in hopes of bridging this gap of understanding: a) The industrial health department must create an image of itself in the minds of management and employee which is beyond reproach in its professional aspects. This favorable impression of the health department reaches the family doctor by permeation and may engender a feeling of respect of his part through which a closer understanding and cooperation may be sought; b) It must be the industrial health department's resolve to encourage employees to have a personal physician and none of its activities should infringe upon this relationship in any way; c) Efforts must be directed towards providing management, the employees and the family doctor with appropriate information so that an understanding stemming from intelligent appreciation can be encouraged.

27,247

Menker, D.F. & Dauer, M. EVALUATION OF FILM BADGE DOSIMETERS FOR OCCUPATIONAL RADIATION EXPOSURE. Indust. Med. Surg., Sept. 1965, 34(9), 700-704. (Radiology Dept., University of Miami School of Medicine, Coral Gables, Fla.).

The film badge is currently the primary means of identifying the radiation dosage of the vast majority of occupationally exposed people in the United States as well as the rest of the world. Most of these people must rely on the commercial film badge services to supply and process their films. With such a large number of people dependent upon film badges, it is vital to know how dependable, accurate, and consistent the commercial suppliers are. 16 commercial film badge suppliers were contacted and asked to participate in this test. A total of 145 badges were exposed to radium-226 and cobalt-60 gamma rays, x-rays from 80 kvp (2.7 mm Al HVL) and 250 kvp (3.0 mm Cu HVL) generators and phosphorus-32 beta particles. After irradiation all badges were returned to the film badge services for processing and reporting. Results were tabulated and compared with the actual measured value and the companies rated without reference to company name. An attempt was made to correlate the reported dose with the films and filters used. There was considerable variation in accuracy among the companies. Although many companies claim an accuracy of better than 10%, only 2.7 to 43% of the reports were within this range. The greatest accuracy occurred with the radium exposures, while the least was with the 80 kvp x-ray radiations.

R 19

27,248

Reuther, W.P. THE WORKER AND HIS MENTAL HEALTH. Indust. Med. Surg., Oct. 1965, 34(10), 777-780.

In the increasingly mechanized and automated society we live in, the industrial worker finds it is not his needs nor those of his family which are prime values. Instead, the needs of the assembly line are dominant. He is becoming depersonalized at his place of work as he loses his sense of performing purposeful, productive work. In our kind of society the end must be to serve man, his needs, desires, aspirations and satisfactions. This, then, emphasizes 1 of the first challenges in planning--the modern imperative that industry, labor government and the mental health professions must find ways of cooperating to produce more wholesome environments in which men work. The overwhelming majority of patients in state mental hospitals are workers or members of workers' families. As a result of our investigation of the problem, the UAW (United Auto Workers) for the first time in 1964 brought into national collective bargaining the proposal to provide comprehensive inpatient and out-of-hospital mental health benefits for workers and their families. The benefits secured are enumerated and discussed.

27,249

Miller, L.F. & Jacobs, R. OPEN-DOOR POLICY: THE INDUSTRIAL HEALTH DEPARTMENT: OBJECTIVES AND ACHIEVEMENTS. Indust. Med. Surg., Oct. 1965, 34(10), 781-785. (Gearhart Medical Center, Chicago, Ill. & Mt. Sinai Hospital, Chicago, Ill.).

The history of industrial medicine is briefly sketched in the introduction to this paper. The following topics are then discussed: a) Accident Prevention; b) Human Factors in Accident Prevention; c) Educational Program; d) Treatment of Injuries and Diseases Arising out of and in the Pursuit of Employment; e) Open-Door Policy. The objective of the open-door policy is the prevention of injuries, accidents and the control of the human factor that plays a role in the employee's relation to his work. The industrial physician is and should be a practitioner of preventive medicine and should be aware that mental health is a factor in accidents. Man's behavior is multiphasic and a disturbed pattern can be detected early if an open-door policy is effective. The paper concludes with the presentation of 3 case histories which exemplify the open-door policy.

R 4

27,250

Stewart, W.W. & Ryan, C.S. ADVANCED BIO-ELECTRONICS: THE VALUE OF THE RKG 100 RADIO-CARDIOGRAM IN INDUSTRY. Indust. Med. Surg., Oct. 1965, 34(10), 788-791. (Sun Oil Company, Philadelphia, Penn.).

In an effort to assess whether occupation is or can be an etiologic or aggravating factor in cardiovascular disease, we at Sun Oil Company decided to study the effect of environmental stress on the cardiovascular system of the employee while performing his work. We formulated a research study in bio-electronics utilizing the radio-cardiogram. The radio-cardiogram (RKG 100) is a method of recording the electrical activity of the heart on an oscilloscope or conventional tape via radio waves. Thus, if the proper conditions prevail the ECG can be transmitted to a receiving and recording station at distances up to 1/4 of a mi. while the individual performs his regular work assignment. Basically, this study represents: a) An analytical and statistical comparison of clinical factors presumably related to cardiovascular disease; b) The percentage positivity of these factors in those with normal and abnormal radiocardiograms; c) A comparison of the resting ECG with the radio-cardiogram with particular reference to their respective value in exhibiting cardiovascular abnormalities; d) The potential clinical and economic value of the RKG as utilized in industry.

R 31

27,251

Lampe, K.F. DETERMINATION OF ATMOSPHERIC LACRIMATORY POTENTIAL BY INSTRUMENTAL METHODS. Indust. Med. Surg., Oct. 1965, 34(10), 797-799. (Pharmacology Dept., University of Miami School of Medicine, Coral Gables, Fla.).

3 instrumental methods are described for the determination of the lacrimatory potential of the atmosphere. In each case, the determination is based on the reaction of lacrimators with sulfhydryl-containing compounds. Of these methods, the polarographic analysis using the Brdicka method proved the most applicable. A method is proposed for the qualitative and quantitative analysis of the individual lacrimators based on the sulfhydryl reaction process.

R 5

27,252

Deichmann, W.B., MacDonald, W.E., Lampe, K.F., Dressler, Irene, et al. NITRO-OLEFINS AS POTENTIAL CARCINOGENS IN AIR POLLUTION. Indust. Med. Surg., Oct. 1965, 34(10), 800-807. (Pharmacology & Pathology Depts., University of Miami School of Medicine, Coral Gables, Fla.).

The 21 possible linear, internally conjugated nitro-olefins having from 4 to 9 carbon atoms were synthesized and their pharmacological and physicochemical properties studied. The eye-irritating properties of 3 representative nitro-olefins were investigated in a joint study with members of the staff of the Los Angeles County Air Pollution Control District. The acute toxicity of each of the compounds was investigated by inhalation, oral intraperitoneal, and cutaneous routes, using rabbits, guinea pigs, rats, mice, chicks and dogs. The subacute inhalation toxicity of each of 4 nitro-olefins representative of the series was studied, using rabbits, guinea pigs, rats and mice. All nitro-olefin compounds are most irritant and toxic. Absorption from the respiratory or gastroenteric tract, peritoneal cavity, or skin, is very rapid. Signs of systemic intoxication appear promptly, including hyperexcitability, tremors, clonic convulsions, tachycardia, increased rate and amplitude of respiration, followed by a generalized depression, ataxia, cyanosis, and dyspnea. Death is initiated by respiratory failure and associated with asphyxial convulsions. Pathological changes are most marked in the lungs, regardless of the mode of administration of a compound.

R 13

27, 253

Eustace, J.F. SHIFT WORK. Indust. Med. Surg., Nov. 1965, 34(11), 857-859. (Medical Dept., Arthur Guinness Son & Co., Ltd., Dublin, Ireland).

The results of several studies which have investigated the adaptability of men to shift work are presented and discussed. A Table on the Arrangement of Various Shift Systems is included. The usual shift times are 0600 to 1400 hours, 1400 to 2200 hours and 2200 to 0600 hours. It has been suggested that since men are no longer tied to public transport, it would be logical to intermit the 2 night shifts at 0100 hours, giving 3 shifts--0100 to 0900 hours, 0900 to 1700 hours and 1700 to 0100 hours. This in effect means that one group works normal day hours and the other 2 groups share the night shifts. The men on the 1700 to 0100 hours shift should in theory get home to rest at the time they need it most, and the 0100 to 0900 hours men, if they adopt the sleep to work to recreation pattern, will avoid sleeping in the early afternoon and should come to work reasonably fresh. The duration of shift work has been the subject of much study and most authorities agree that, if possible, men should not work for more than 3 days on any shift, as this means they will not have to invert to night shifts and then it will not be necessary to revert to the normal diurnal rhythm.

27,254

McRoberts, J.W. SEAT BELT INJURIES AND LEGAL ASPECTS. Indust. Med. Surg., Nov. 1965, 34(11), 866-869. (Sheboygan Clinic, Sheboygan, Wisc.).

The first section of this paper is concerned with various legal aspects of seat belt installation. At least 20 states have adopted legislation requiring the installation of seat belts in cars sold in such states. Since it is mandatory to install seat belts in these states, it must be assumed that all drivers and front-seat passengers are required to use them. In a minority of states it is possible to assess a percentage of damage as the "cost" of contributory negligence. In the vast majority of the states, contributory negligence would be a complete defense. In these states, the defense might have to show that the failure to use seat belts was a substantial factor in producing the injuries. The remainder of the article discusses seat belt injuries in general and one fatal case in particular. All of the reports cited in this paper presented evidence that the seat belt presents no hazard to occupants except possibly in unusual and isolated instances. In very severe accidents the snubbing effect of the seat belt may produce injuries in the lower abdomen and pelvic areas, but it is noted that the excess speed and the sudden and violent changes in direction would probably have killed the person in any event.

R 9

27,255

Breyse, P.A. SAFE PRACTICES FOR INDUSTRIAL SCUBA DIVING. Indust. Med. Surg., Nov. 1965, 34(11), 870-873. (Preventive Medicine Dept., University of Washington, Seattle, Wash.).

Recognizing that SCUBA divers are subject to many potential hazards and that they must be physically and mentally fit, be adequately trained in the use of SCUBA and possess the necessary mechanical skills to perform their prescribed functions satisfactorily, and that their safety and well-being depends to a large degree upon equipment being in good working order and upon an air supply essentially free from contamination, the Safety Division, Washington State Department of Labor and Industries, appointed a committee to assist the Code Engineer in the completion of SCUBA Diving Safety Standards. This committee was composed of representatives of both labor and management and other interested groups, a large number of which had considerable experience in SCUBA diving activities and diving medicine. These standards should provide a better awareness of the hazards involved in diving, in addition to minimum requirements for diving safety (recognizing that diving can be safe provided it is practiced by well-trained, equipped and informed individuals).

27,256

Yntema, D.B. & Klem, L. TELLING A COMPUTER HOW TO EVALUATE MULTIDIMENSIONAL SITUATIONS. IEEE Trans. on Hum. Factors in Electronics, Sept. 1965, HFE-6(1), 3-13. (Lincoln Lab., Massachusetts Institute of Technology, Lexington, Mass.).

If a person could tell a computer exactly how he would evaluate every alternative that might arise, the machine could decide between any 2 alternatives as the person himself would. A fairly realistic experiment was done to test the feasibility of "interpolation between corners" as a psychophysical method for telling a machine how to compute the worths of multidimensional alternatives. The results were satisfactory. A statistic called fractional disagreement is proposed as the proper measure of the machine's success in mimicking the man's decisions. The concept of conflict between the dimensions of 2 alternatives is explained. The size of the conflict and the size of the difference between the worths that the machine ascribed to the alternatives were found to help to predict the correctness of the machine's decision. Conflict and difference in computed worth should, therefore, be useful in defining regions where the machine should give the decision back to the man and tell him to make the choice.

R 2

27,257

Fogel, L.J., Owens, A.J. & Walsh, M.J. INTELLIGENT DECISION-MAKING THROUGH A SIMULATION OF EVOLUTION. IEEE Trans. on Hum. Factors in Electronics, Sept. 1965, HFE-6(1), 13-23. (Convair, General Dynamics Corporation, San Diego, Calif.).

Artificial intelligence can be approached through the fast-time evolution of finite-state machines. Random mutation of an arbitrary machine yields an "offspring." Both machines are driven by the available history and evaluated in terms of the given goal, and the machine having the higher score is selected to serve as the new parent. Such fast-time mutation and selection is continued with real-time decisions being based on the logic of the surviving machine. Saving the best few machines increases the security against gross nonstationarity of the environment. The efficiency of the evolutionary program is improved by introducing a cost-for-complexity weighting on each machine. An ability to predict one's environment is prerequisite to purposeful behavior. With this in mind, IBM7094 experiments were conducted to examine evolutionary prediction. As expected, cyclic signals in various degrees of noise were soon characterized by the predictor-machines. The transition probabilities within the sequence of predictions of low-order Markov processes were in close correspondence with those of the environment. The evolutionary program was also required to predict the (4-symbol) output sequence of an arbitrary machine that was driven by random binary noise. After 160 predictions the percent correct reached 51.5. When the evolutionary program was also given, the input binary variable, this score reached 80%, showing a rapid approach toward the 100% asymptote. In contrast, providing an uncorrelated binary variable degraded the performance to 40.5% by requiring an attempt to extract nonexistent information. A formal technique was devised which translates a predictor machine into a set of hypotheses concerning the logic of the environment.

R 3

27,258

Bekey, G.A., Meissinger, H.F. & Rose, R.E. MATHEMATICAL MODELS OF HUMAN OPERATORS IN SIMPLE TWO-AXIS MANUAL CONTROL SYSTEMS. IEEE Trans. on Hum. Factors in Electronics, Sept. 1965, HFE-6(1), 42-52. (University of Southern California, Los Angeles, Calif.).

An application of continuous parameter optimization techniques to the synthesis of a model of human tracking behavior in a simple 2-axis task is presented. Considerable emphasis is placed on the measurement of performance criteria for estimating the relative difficulty of single-axis and 2-axis tasks as well as for evaluation of the validity of mathematical models. It is shown that the modeling technique can be used to yield a quantitative indication of the degree of cross coupling between axes introduced by the operator.

R 16

27,259

Wierwille, W.W. A THEORY FOR OPTIMAL DETERMINISTIC CHARACTERIZATION OF TIME-VARYING HUMAN OPERATOR DYNAMICS. IEEE Trans. on Hum. Factors in Electronics, Sept. 1965, HFE-6(1), 53-61. (Cornell Aeronautical Laboratory, Inc., Cornell University, Buffalo, N.Y.).

A deterministic theory of characterization is presented which can be used to determine the time-varying dynamics of the human operator engaged in a tracking task. With this theory it is possible to obtain a time-varying impulse response function and a time-varying transfer function which represent the action of a human operator in an open- or closed-loop control system. No special form of input is required. The characterization, that may be in either real-time or nonreal-time, is based upon an exact theory of fixed-form optimization. A strongly convergent, definitely stable iteration technique can be used to realize the optimal characterization filter. The theory takes the time variation of the impulse response or transfer function into account, so that it is unnecessary to make the assumption of slowly varying dynamics. An uncertainty or compromise exists between the error, i.e., the error between the output of the human operator and that of the optimal characterizing filter, and the degree of variability of the optimal characterizing filter. This uncertainty is fundamental, and therefore cannot be circumvented. Although the theory has been verified by extensive experimental study, emphasis here is placed upon presentation of the theory.

R 16

27,260

Miller, D.C. THE EFFECTS OF PERFORMANCE-SCORING CRITERIA ON COMPENSATORY TRACKING BEHAVIOR. IEEE Trans. on Hum. Factors in Electronics, Sept. 1965, HFE-6(1), 62-65. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

A compensatory tracking experiment was performed in which a S received continuous feedback of his performance as measured by a scoring criterion. Several such criteria were investigated, each consisting of a weighted sum of mean-squared error and mean-squared stick movement. The S changed his tracking behavior to suit the scoring criterion. These changes were manifested primarily as changes in the gain of the S's describing function. It appears that a well-trained S is good at optimizing his behavior to suit a scoring criterion, and that the design and feedback of such scoring criteria should receive greater consideration in tracking experiments.

R 4

27,261

Kreifeldt, J.G. A SAMPLED-DATA PURSUIT TRACKING MODEL. IEEE Trans. on Hum. Factors in Electronics, Sept. 1965, HFE-6(1), 65-73. (Case Institute of Technology, Cleveland, Ohio).

A sampled-data pursuit hand-tracking model for the human operator is developed and tested. The model embodies the simplest a priori assumptions about human tracking behavior. The analytical model is presented along with the experimentally determined frequency transfer characteristics of an analog computer built to have the same transfer function as the mathematical model. Generally good agreement was obtained in matching the model's frequency and time-domain responses to those of a well-trained human, tracking in pursuit fashion an input power spectrum flat to 0.64 c/s.

R 6

27,262

Bratt, H.R. BIOMEDICAL ASPECTS OF THE X-15 PROGRAM-1959-1964. FINAL REPORT. Proj. 653A, FTC TR 65 24, Aug. 1965, 17pp. USAF Flight Test Center, Edwards AFB, Calif.

The Air Force Flight Test Center Bioastronautics support of the X-15 Flight Research Program had 3 principle objectives: a) provide the pressure suit equipment for pilot protection; b) provide flight monitoring for flight safety; and c) collect in-flight physiological data from X-15 pilots. The pressure suit equipment has undergone 2 cycles of development during the X-15 program. The MC-2 suit used in the early phases of the X-15 program was a multi-piece garment donned in 3 separate layers. Although the MC-2 was reasonably comfortable when properly fitted and provided adequate pilot protection, the suit had a number of deficiencies. These deficiencies were corrected in the next cycle which developed the A/P-22S-2 suit. The development of a pressure-sealing zipper closure permitted the incorporation of the separate components of the MC-2 suit into a single garment. During the use of the A/P-22S-2 suit in the X-15 program, there has been a continuous process of refinement resulting in greater comfort, maintainability, and reliability of this equipment. The bioinstrumentation system used for flight monitoring and physiological data collection has also undergone progressive modification and refinement during the X-15 flight program to improve reliability and provide more data. The latest modifications to this system provided for the telemetry of helmet-suit pressure differential, suit-cabin pressure differential, cabin pressure, 2 axes of acceleration ( $A_x$  &  $A_z$ ), one-channel electrocardiogram, Korotkoff sounds, and cuff pressure for blood pressure measurements. A miniaturized signal conditioning package, worn on the pilot's pressure suit, was used in X-15 No. 2.

R 5

27,263

Anderson, R.O. MANUAL OPTIMUM VS. THEORETICAL OPTIMUM. IEEE Trans. on Hum. Factors in Electronics, Sept. 1965, HFE-6(1), 84-86. (USAF Flight Control Div., Wright-Patterson AFB, Ohio).

The optimum closed-loop transfer function for a pilot to minimize a sum of mean-squared error and mean-squared joystick displacement has a second-order denominator with a fixed damping ratio, undamped natural frequency as a function of  $\beta$  and  $k$ , and a numerator which is a constant function of  $\beta$ ,  $k$ , and  $\omega_0$ .

R 2

27,264

Ullman, J.R. & Evans, C.R. A PROPOSED BEHAVIORAL TEST FOR DISTINGUISHING BETWEEN THE PERCEPTUAL JUDGMENT MECHANISMS OF HUMANS AND THOSE OF A MACHINE. IEEE Trans. on Hum. Factors in Electronics, Sept. 1965, HFE-6(1), 86-90. (National Physical Laboratory, Teddington, Middlesex, England).

In this paper a behavioral test is proposed, which, if passed by human Ss, and failed by a machine would indicate something more than a quantitative difference in logical design between the brain and the character recognition machine. In Phase I, 60 Ss were asked to judge a set of patterns drawn by 12 other Ss in a pilot run. They were then asked to produce 3 original sets according to their instructions. The instructions, shown here in full, were read slowly to each S in turn. In Phase II of the experiment, the procedure was unchanged, with the exception that the creation of new patterns was not required and Ss were, consequently, not read the second set of instructions. There is considerable disparity between human and random judgments, the test proposed in the introduction is sensible, though not necessarily conclusive.

R 6

27,265

Cannon, R.H., Jr. & Eppler, W.G., Jr. VECTOR RETICLE, CONTROL ACTION DISPLAY IN MANUAL CONTROL OF SPACE VEHICLE ATTITUDE. J. Spacecraft & Rockets, March-April 1965, 2(2), 172-182. (Stanford University, Stanford, Calif. & Missiles & Space Company, Lockheed Aircraft Corp., Palo Alto, Calif.).

2 concepts, the vector reticle and control action display, are submitted as effective means for making manual 3-axis attitude control quicker and more efficient while reducing substantially the concentration required of the pilot. A system design is submitted in which the 2 concepts are combined in a control action reticle and in which the pilot has direct control of the jet valves. (The entire system may be mechanical.) The system is controlled to a visual reference or to an instrument attitude reference. Malfunction of the system cannot interfere with normal manual control. The vector reticle presents all auxiliary information in a single 3-part geometric vector superimposed on the window (rather than on 3 separate dials, for example), thus reducing the number of quantities to be monitored from 3 to 1. Control action display gives the pilot instantaneous and exclusive control of the reticle, thus removing the need for 2 mental integrations and greatly reducing the concentration required for tracking. Results are presented of 3-axis (fixed-base) simulation studies of the proposed system and of other systems for comparisons.

R 14

27,266

Stone, R.W., Jr. & Letko, W. TOLERANCE TO VEHICLE ROTATION OF SUBJECTS USING TURNING AND NODDING MOTION OF THE HEAD WHILE PERFORMING SIMPLE TASKS. J. Spacecraft & Rockets, May-June 1965, 2(3), 437-442. (Langley Research Center, NASA, Hampton, Va.).

Rotation of space stations to provide artificial gravity may be used to combat the effects of long exposure to weightlessness. It has been established that motion of the head out of the plane of vehicle rotation results in nystagmus, visual illusions, sweating, and nausea. Cross-coupled accelerations are induced by these motions and are the cause of these disturbances. In order to obtain quantitative data on the magnitude of these induced cross-coupled accelerations that can be tolerated by man, an investigation was initiated at NASA Langley. The Langley Ss, lying on their backs, feet outward, were inclosed in a small cabin on a simple rotating-vehicle simulator. The Ss were required to move their heads in a specified manner in response to light signals. The head position and rate of motion, as well as reaction time, were recorded. Results have been obtained for cases where the S is required to make turning and nodding motions of his head. The results indicate that the Ss cannot tolerate the stimulation experienced when nodding as well as they can tolerate the stimulus of the turning-head motion. The toleration to these various stimulations is discussed. Experiments to determine what value of cross-coupled acceleration can be tolerated for the nodding case are also mentioned and referenced.

R 7

27,267

Spielberg, I.N. & Cohen, C.B. JANUS: A MANNED ORBITAL SPACECRAFT WITH STAGED RE-ENTRY. J. Spacecraft & Rockets, July-Aug. 1965, 2(4), 531-536. (TRW Space Technology Laboratories, Redondo Beach, Calif.).

The Janus concept comprises a blunt, lifting body re-entry vehicle with its upper surface formed largely by a delta-wing aircraft. The lifting body furnishes a large volume in the spacecraft for orbital operations, serves as the re-entry heat shield, and provides a substantial aerodynamic maneuver capability. After the re-entry heating and loading period, the aircraft is separated from the "pod" at subsonic speed and proceeds to a preselected landing site. The airplane also provides an unusual abort capability. Preliminary conservative sizing of the spacecraft, for an arbitrarily selected 2-week, low-altitude orbit mission with a 3-man crew, yields an over-all length of 27 ft, a span of 16 ft, a depth of 10 ft, and a useful payload volume of 860 ft<sup>3</sup>. The total weight is about 16,000 lb, including 4000 lb for the airplane, its equipment, and the crew. By use of lift/drag ratios from 0.35 to 0.75, the spacecraft re-entry range can be varied from a nominal landing point to a site as far as 1200 naut mi downrange or 800 naut mi uprange. By rolling, a side range of 400 naut mi is also obtainable. In addition, the airplane range extends the "footprint" 200 naut mi in any direction.

R 3

27,268

Testaguzza, L., Wolfe, G.L. & DiGiorgio, J. FLIGHT VERIFICATION OF SATELLITE THERMODYNAMIC ANALYTICAL TECHNIQUES AND APPLICATION TO MANNED SPACECRAFT. J. Spacecraft & Rockets, July-Aug. 1965, 2(4), 537-542. (Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif.).

The acquisition of tape-recorded thermal data from an orbiting spacecraft has provided a means of verifying analytical methods and techniques. Continuous monitoring of the temperature excursions of the vehicle structure and components led to an excellent correlation between flight data and analytical predictions. This experiment also provided data, which permitted the study of the thermal behavior and attitude of a nonoriented (tumbling) space vehicle. It was found that inherent attitude perturbations (tumbling) caused by the earth oblateness could be simplified, for thermal purposes, by a pitch-roll analog. A method for determining attitude from temperature data is described. Another significant result demonstrated the importance of knowing the exact location of each temperature sensor; 1 sensor, located 7.1" from the analytical node center, recorded data 10° to 40°F above predicted temperatures. The instrumentation and ground-space telemetry system used in this experiment are described.

R 2

27,269

Besco, R.O. HANDLING QUALITIES CRITERIA FOR MANNED SPACECRAFT ATTITUDE-CONTROL SYSTEMS. J. Spacecraft & Rockets, July-Aug. 1965, 2(4), 628-630. (Hughes Aircraft Company, Culver City, Calif.).

It does seem possible to describe spacecraft attitude-control systems with parameters or characteristics that will be common to all types of vehicle and mission applications. The 5 basic characteristics presented herein--amplitude, duration, initiation time, frequency, direction--constitute an acceptable set, and they can be useful in both analysis and synthesis. The handling qualities parameters derived from these basic characteristics are critical to system effectiveness. The torque advantage ratio (TAR) and control system authority (CSA), as defined herein, are suggested as handling qualities parameters that can be defined for all systems.

R 5

27,270

Barker, L.K. & Queijo, M.J. THRUST VECTOR ORIENTATION IN PILOT-CONTROLLED LUNAR LANDINGS. J. Spacecraft & Rockets, Sept.-Oct. 1965, 2(5), 816-817. (Langley Research Center, NASA, Hampton, Va.).

An analytical study has been made to determine the possibility of using visual references as an aid in thrust vector orientation for pilot-controlled lunar landings. It was found that during gravity-turn landings, the angle between the lander thrust vector and the line of sight to an orbiting spacecraft remained essentially constant until the landing was almost completed. Nominal trajectories were then computed where the angle between the lander thrust axis and the orbiting vehicle was maintained constant. The results showed that efficient landings could be made in this manner, and it appears as if the technique offers a means of satisfactory manual control during the lunar landing.

27,271

Frankel, G., Albright, G. & Axelrod, I. MANNED CHAMBER TESTING OF THE APOLLO PROTOTYPE SPACE SUIT. J. Spacecraft & Rockets, Sept.-Oct. 1965, 2(5), 822-824. (Republic Aviation Corporation, Farmingdale, N.Y.).

Suited Ss at 35,000-ft simulated altitude, instrumented for electrocardiograms and rectal and skin temperatures, performed work satisfactorily on a bicycle ergometer at a constant metabolic rate (1500 Btu/hr) while the ventilation rate was successively increased from 2.5 to 5.8 cfm STP and at different metabolic rates (1080 & 1655 Btu/hr) while the ventilation rate was held constant at 4.1 cfm at STP. At a work load of 1.5 Kp on the ergometer, the total heat leaving the S was calculated to be 1641 Btu/hr (sensible, 149; latent, 1292; mechanical, 250; convective and radiant, -50) compared to a metabolic generation rate (as indicated by CO<sub>2</sub> production) of 1655 Btu/hr. Results of the first test suggest that the heat removed by the ventilation stream would not be significantly increased by a flow rate greater than 4 cfm at STP, at which the ventilation efficiency was 58% for  $Q_{met}=1500$  Btu/hr. These limited data suggest that the suit ventilation is adequate for continuous work at the levels investigated, but that body dehydration would result from prolonged work in the suit.

R 2

27,272

Kurkowski, R.L. & Grover, K.C. SIGHTING ACCURACY USING A SIMULATED VEHICLE-MOUNTED SPACE SEXTANT. J. Spacecraft & Rockets, Nov.-Dec. 1965, 2(6), 876-882. (Ames Research Center, NASA, Moffett Field, Calif.).

The operation and performance of a navigator-controlled sextant mounted in a simulated space vehicle has been studied. The study indicates that the sextant-navigator system can provide accurate information required for manned space flight navigation. With no landmark motion and fixed vehicle attitude, the basic angle measurement accuracy level of several Ss was  $\pm 6$  arc sec ( $3\sigma$ ). With landmark line-of-sight rates of 200 arc sec/sec, the accuracy was reduced to  $\pm 10$  arc sec. When the vehicle control was used to reduce the vehicle motion from initial rates greater than 200 arc sec/sec, the accuracy was  $\pm 10$  arc sec ( $3\sigma$ ).

R 3

27,273

Wingrove, R.C. TRAJECTORY CONTROL PROBLEMS IN PLANETARY ENTRY OF MANNED VEHICLES. J. Spacecraft & Rockets, Nov.-Dec. 1965, 2(6), 883-888. (Ames Research Center, NASA, Moffett Field, Calif.).

This paper discusses the problems associated with controlling the trajectory of a space vehicle entering the atmospheres of Earth and Mars. These control problems include the capture maneuvers for Earth entry velocities up to 70,000 fps, the capture maneuvers for Mars entry velocities up to 40,000 fps, and the skip-out control to a parking orbit at Mars. Utilizing a flight simulator, results were obtained for both automatic and piloted-guidance systems. The results indicate that, for Earth entry velocities of 70,000 fps with a lift-to-drag ratio (L/D) 1.0 vehicle, there is approximately a 1-sec interval within which a roll maneuver must be initiated to insure capture without exceeding a 10-g acceleration limit. For automatic control systems, with a vehicle maximum roll rate above 15 deg/sec, the full entry corridor can be utilized. For piloted backup systems, though, successful capture is limited to Earth entry velocities less than about 65,000 fps because of the critical timing involved. For entries at Mars, the capture maneuver is shown to be less critical. An uncertainty of  $\pm 25\%$  in the Mars atmosphere density scale height does not degrade the ability of the entry guidance system to utilize the full entry corridor or to perform the skip-out control to a parking orbit.

R 35

27,274

French, F.W. & Hansen, K.F. RADIATION SHIELDING REQUIREMENTS FOR MANNED SATELLITES. J. Spacecraft & Rockets, Nov.-Dec. 1965, 2(6), 931-937. (Mitre Corporation, Bedford, Mass.).

The radiation shielding requirements for the protection of the crews of manned satellites are investigated. 2 diverse types of missions are studied: a long-duration, high-altitude mission above the Van Allen Belt, and a short-duration, low-altitude, polar mission below it. Radiobiological tolerance criteria are considered, and a criterion based on partial recovery of sustained somatic damage is examined for the long-duration mission. Model solar flare, cosmic, and Van Allen Belt radiation environments are postulated. Radiation transport calculations are carried out to obtain the biological doses due to the various environmental components. Curves of dose vs shielding thickness, together with the model environments and the postulated radiobiological tolerance criteria, are used to calculate minimum amounts of shielding. For the high-altitude mission, results show that considerable savings in shielding weight are obtained if a radiation recovery criterion, rather than a straight cumulative-dose criterion, is used. For the low-altitude mission, the effects of different geomagnetic field models in modifying the free-space dose and the results of using different target models are illustrated.

R 21

27,275

Chappee, J.H. & Smith, G.B., Jr. MAN-RATING CONSIDERATIONS IN THE DESIGN AND OPERATION OF HARD VACUUM CHAMBERS. J. Spacecraft & Rockets, Nov.-Dec. 1965, 2(6), 965-967. (Manned Spacecraft Center, NASA, Houston, Tex.).

The man-rating criteria and considerations developed for the space chambers of the Space Environment Simulation Laboratory (SESL) of the NASA Manned Spacecraft Center, have a basic applicability to all of the space chambers. These considerations and criteria were developed in the following areas: philosophy and procedures of manned testing, repressurization requirements, instrumentation and bioinstrumentation requirements, and personal equipment--oxygen and cooling systems. (HEIAS)

27,276

Lindberg, R.G., DeBuono, G.J. & Anderson, M.M. ANIMAL TEMPERATURE SENSING FOR ORBITAL STUDIES ON CIRCADIAN RHYTHMS. J. Spacecraft & Rockets, Nov.-Dec. 1965, 2(6), 986-988. (Northrop Space Laboratories, Hawthorne, Calif.).

Data from metabolic studies on pocket mice show that *Perognathus longimembris* has a circadian metabolic rhythm that can be detected at both moderate (22°-24°C) and low (10°C) environmental temperatures, at high and low humidities, in the dark or under normal photoperiod with and without food, in normal atmospheres and 100% oxygen, and in both individually housed and grouped mice.<sup>2</sup> Placing these animals in earth orbit should elucidate the effects of exogenous factors that may influence a persistent endogenous rhythm. Whereas the most obvious exogenous cues to be studied are weightlessness and orbital period, the experimental design is easily adapted to provide for the input of almost any specific environmental stimuli in the isolation of space. This note describes the basic experimental package for studying these rhythms in pocket mice during prolonged orbital flight. Also the data handling system in terms of the main elements of the program is detailed.

R 2

27,277

Brady, P.T. A TECHNIQUE FOR INVESTIGATING ON-OFF PATTERNS OF SPEECH. Bell Sys. tech. J., Jan. 1965, XLIV(1), 1-22.

A study is made of certain properties of speech which are concerned with determining the presence of speech on a telephone circuit. A speech detector is constructed to yield an output of spurts and gaps, corresponding to the presence or absence of energy above a threshold. A computer program then attempts to correct this pattern for spurious noise operation and for gaps due to stop consonants, eventually yielding a pattern of talkspurts and pauses. Data reported here include the distributions of the spurts and gaps resulting from the detector as well as the distributions of talkspurts and pauses from the computer program. Studied here are the influence on these distributions of detector threshold variations as well as of parameter variations within the computer program. The gaps occurring within talkspurts retain their distribution over a range of thresholds, but the spurts do not. It appears that 200 msec forms a boundary between intersyllabic gaps and listener-detected pauses. The detection technique developed here is considered to be an improvement over conventional methods, but still yields data whose significance is uncertain. It may be that a simple automatic speech detecting technique using fixed parameters is inadequate for some purposes.

27,278

Brady, P.T. A STATISTICAL BASIS FOR OBJECTIVE MEASUREMENT OF SPEECH LEVELS. Bell Sys. tech. J., Sept. 1965, XLIV(7), 1453-1486.

First-order probability distributions of speech amplitudes are studied to establish a theoretical basis for obtaining a measure of speech level. The logarithm of the long-term waveform of the speech envelope is found to be approximately uniformly distributed above a threshold. The average peak level (apl) is obtained by taking the time average of the log of the envelope waveform and deriving from it the peak of the log-uniform distribution which would have produced the same average. A theoretical analysis of various properties of the apl indicates that, within certain bound, the apl satisfies a postulated set of requirements of an "ideal" speech level measure. A critical requirement is that the measure remain independent of the value of a threshold employed by a speech detector in the measuring device. It appears that variation in the threshold can typically change the apl by about 1 db. The Digital Speech Level Meter is described as an instrumentation of the technique used to obtain the apl. Measurements made with this meter are easily obtained and very repeatable, and are in general agreement with theoretical predictions.

R 9

27,279

Weiss, W. & Solomon, H. THE EFFECTS OF KNOWLEDGE OF SOURCE BEFORE VS. AFTER EXPOSURE TO A COMMUNICATION. Contract NONR 4309(00), Proj. RR 006 08 02, Tech. Rep. 4, Sept. 1965, 12pp. Hunter College of the City University, New York, N.Y. (AD 621144)

The major purpose of this study was to determine the attitude change effectiveness of identifying the source of a communication before vs after exposure to the communication. If as Asch suggests, the effects of source credibility are mediated by a source-induced "cognitive framework" for interpreting the communication, then, identifying the high and low prestige sources only after exposure to the communication has occurred should produce a difference in the magnitude of differential source effects in comparison with that obtained when the source is identified before exposure. 130 college students read the same persuasive communication under 4 experimental conditions: higher or lower prestige source identified before or after exposure to the communication. They also expressed their willingness to convince a friend and to distribute literature in support of the communicator's point of view. In respect to attitude on the issue, there were no interactions between placement of the source and the nature of the source. In fact, contrary to what might be expected from Asch's perspective, the initially unfavorable Ss were differentially affected by the sources when identified after the communication not before. This result suggests that an initially unfavorable attitude on an issue can be modified by regard for the source without the mediation of a cognitive process that operates during the exposure to the communication. Regardless of whether the sources were made known before or after exposure to the communication, the higher prestige source induced greater willingness among the initially unfavorable Ss to perform actions supporting the source's viewpoint than did the lower prestige source. Source did not affect those initially favorable.

R 6

27,280

Ball, R.J. & Bartley, S.H. EFFECTS OF TEMPORAL MANIPULATION OF PHOTIC STIMULATION ON PERCEIVED BRIGHTNESS, HUE AND SATURATION. Amer. J. Optom. & Arch. Amer. Acad. Optom., Oct. 1965, 42(10), 573-581. (Psychology Dept., Michigan State College, East Lansing, Mich.).

This article reviews research being conducted on the temporal variables in photic input and how they integrate with size, intensity, and wavelength variables in the over-all production of vision. The research utilizes manipulation of the photic input as the stimulus, and subjective judgments based on resultant visual perception as the response. These data thus represent complex integrations of the 3 classical levels of the visual system. The perceptual attributes of brightness, hue, and saturation have been found to be very strongly influenced by the temporal aspects of how the photic energy strikes the retina, independent of intensity and wavelength, i.e. these attributes can be drastically altered simply by changing the time characteristics of the stimulus. Typical experimental results are presented and compared with some of the classical relationships as well as other current visual research in the area. Several areas in which future work will be done also are mentioned.

R 12

27,281

Exford, Joan. A LONGITUDINAL STUDY OF REFRACTIVE TRENDS AFTER AGE FORTY. Amer. J. Optom. & Arch. Amer. Acad. Optom., Nov. 1965, 42(11), 685-692. (Optometry College, Pacific University, Forest Grove, Ore.).

Longitudinal plots of the corneal and total refractive powers of the right eyes of 46 optometric patients who had each been examined at least twice after age 40 showed a very small ( $-0.02$  D. per yr.) but continuous average increase in corneal curvature, and a substantial (approximately  $0.06$  D. per yr.) and continuous average decrease in total refraction (toward more hypermetropia). Neither the corneal nor the total astigmatism showed any characteristic trends with age.

R 9

27,282

Ross, R.S. SPEECH COMMUNICATION. FUNDAMENTALS AND PRACTICE. 1965, 245pp. Prentice-Hall, Inc., Englewood Cliffs, N.J. (Wayne State University, Detroit, Mich.).

This book is an attempt to revitalize the time-tested arts and skills of good public speaking by adding to them a knowledge of modern communication theory. It contains the best of the old emphasis on skills of language, thought, voice, action, and rhetoric. But it also updates and modifies the old with the best of the new theory and research. The distinguishing characteristics of this book are: a) a view of speech and communication as a dynamic process, a system of coding, decoding, and recoding ideas and emotions; b) a re-emphasis on the role of language in speech including considerable discussion of abstraction and generalization as well as words, sentences, and context; c) a historical as well as a psychological approach to persuasion, drawing on A. H. Maslow's classification of dynamic needs and Kluckhohn and Murray's writings on personality. The research findings of rationalistic or "both-sides" persuasion, which have long been overlooked by authors of speech texts, have also been utilized; d) learning theory is related in an uncomplicated way to the presenting of information; the role of visual aids is emphasized; and Edgar Dale's "cone of experience" is the cornerstone of the discussion; e) the problem of speech anxiety is discussed frankly, and a sound psychological explanation is given; f) the rigor of a traditional public-speaking routine is not de-emphasized in the face of these modern contributions. Purpose, delivery, preparation, outlining, arrangement, voice, action, and logic are all discussed fully. R many

27,283

Armington, J.C. VISION. Ann. Rev. Physiol., 1965, 27, 163-182. (USA Walter Reed Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

Particular consideration is given in this review of the topic of vision to new biophysical techniques for studying visual processes, the electrophysiology of visions, and some changes in the methods for interpreting data. (HEIAS)

R 116

27,284

Thompson, H. JOINT MAN/MACHINE DECISIONS. 1965, 157pp. Systems & Procedures Association, Cleveland, Ohio.

The impact of computers and ancillary devices has affected the world of business, government, and everyday life. More and more the interface of man and machine becomes more significant. This book traces the prospective impact of computer systems on management decision-making processes through 10 chapters. (HEIAS)

27,285

Aviation Week. SITUATION DISPLAY OFFERS WIDE DATA RANGE. Aviation Week, Aug. 1965, 83(5), 91-92. (330 West 42nd St., New York, N.Y.).

An unusual horizontal situation display which is intended to maximize the amount of useful information that can be presented to a pilot flying high-speed, low-altitude missions is being developed here by ITT Gilfillan. The display is expected to combine the features of a cathode ray tube and optical-film projection system. It will present the pilot of a high-performance aircraft with the many types of data he needs for easily orienting himself and quickly making decisions during tough low-altitude missions when he has little time for studying maps. The display will indicate his position and heading with respect to en-route or terminal maps or reconnaissance photographs, will present any special instructions by selection, will provide steering information and, if desired, will overlay radar information on a map. Alternately, it can display radar information, or any other type of cathode ray tube data, alone.

27,286

Aviation Week. PILOT REACTION TO SPERRY DISPLAY ASSESSED. Aviation Week, Aug. 1965, 83(6), 115-117. (330 West 42nd St., New York, N.Y.).

2 windshield display configurations were tested to determine the relative pilot confidence level in these as compared to conventional panel instruments. During flight simulator approaches (using an autopilot and an approach-flareout coupler), 2 different types of simulated malfunctions were introduced without warning: "stand-off error" and semi-hardover signal. The pilot would disengage the autopilot and take over, electing either to continue the approach or go around. 6 Ss made 44 approaches with each windshield display and the conventional instruments under malfunction and normal conditions. The altitudes at which the pilot elected to take over control from a malfunctioning autopilot (1 measure of confidence in the display) were: 349 ft-conventional, 217 ft-windshield display (no flight director information), 200 ft-windshield display (with flight director information); the percentage of approaches changed to go-around (second confidence measure): 9.6% go-arounds-conventional, 2.9%-windshield. Also interviews with pilots after testing indicated unanimous favor for windshield displays with suggestions for improvement of same. (HEIAS)



27,287

Klass, P.J. "RAINBOW" OPTICAL PROJECTOR AIDS LANDING. Aviation Week, Aug. 1965, 83(8), 63-65.

Simple, inexpensive optical landing aid has been developed which tells the pilot how much to change his aircraft's sink rate to intercept the glide path and touch down at the desired point. The device also indicates whether the aircraft is above, below or on the glide path. The landing aid, called Rainbow, was developed by the Naval Research Laboratory (NRL) for possible use on air carriers. It could also find application at civil airports and military airfields, especially in limited warfare situations. No equipment is needed aboard the aircraft, and the small optical projector can be set up in a few minutes. Rainbow is not an all-weather landing aid, for it depends upon the pilot's ability to see the output lens of a projector. During clear weather the lens is visible over several miles in the daylight, and by night the range is more than 20 miles. Rainbow is further described and illustrated. It is compared with the Fresnel Lens Optical Landing System which is currently installed on Navy carriers.

27,288

O'Lone, R.G. NEW ROLES SEEN FOR HUMAN EYES IN SPACE. Aviation Week, Aug. 1965, 83(9), 51-53.

This article briefly presents the highlights of 2 reports heard at a symposium of the Society of Photo-Optical Instrumentation engineers. The subject of the first report was summarized as follows: the human eye has a remarkable tracking ability that might be harnessed to perform such control functions as operating a telescope. The Honeywell Radiation Center is building an engineering model of an oculometer, in order to establish its feasibility as a practical method of measuring eye direction. This direct information, in theory, could then be passed on to a control system. In this way "the superior performance of the eye-brain combination could be utilized without at the same time incurring the limitations inherent in conventional manual control." Man's unexpected range of vision in space was emphasized to the society in the second report. Astronaut experience and simulation studies were cited. (HEIAS)

27,289

Hibben, R.D. USAF STUDYING SPACE TOOL DEVELOPMENT. Aviation Week, Sept. 1965, 83(11), 58-61, 65-66, 73-79.

Development of tools for the maintenance, repair and assembly of spacecraft will depend largely on the use of test beds in space to define problem areas. In the absence, at present, of operational test beds such as the manned orbiting laboratory (MOL), Air Force is examining general concepts, techniques and tools to accomplish maintenance on representative subsystems in space without designing equipment to maintain a specific system. Prototype equipment is tested in-house on a 6-degree-of-freedom simulator and zero-gravity simulation on Boeing KC-135 and Convair C-131 aircraft. Most tools developed for repairs or assembly will have to be able to join materials or to torque various types of fasteners. Current programs concerning the joining of materials and objects in space deal with adhesives, soldering, brazing, welding and mechanical fasteners. One of several proposed orbital maintenance experiments is described. The major topics discussed are as follows: a) Wire soldering; b) Welder design; c) Torque requirements; d) Canceling tool; e) Wire-joining tool; f) Adhesive bond.

27,290

Klass, P.J. COMPUTER AID TO TRAFFIC CONTROL EXPANDS. Aviation Week, Nov. 1965, 83(20), 107-111.

The application of computers to air traffic control problems is discussed. Its present role involves handling the more routine duties of tracking and tagging; future assistance in judgment-type functions remains to be agreed upon. The capabilities of this system, the man-machine interaction, and the speed of transition to automation are considered. The results of simulation tests and current experimental facilities are described briefly. (HEIAS)

27,291

Hibben, R.D. SAFETY CAR STUDY USES SYSTEMS APPROACH. Aviation Week, Dec. 1965, 83(25), 53-57.

Under a systems engineering approach, Republic Airation will conduct a systematic analysis of all possible interrelationships between the man, the automobile, the road and traffic. Items to be considered are materials and structures, driving controls, restraint systems, passenger compartment crash integrity, drive system, and fail-safe mechanisms and equipment. (HEIAS)

27,292

Levatic, J.L. DIGITAL VOICE TO EXTEND AIR-GROUND COMMUNICATIONS RANGES. Proc. IEEE, June 1965, 53(6), 644-645. (Mitre Corporation, Arlington, Va.).

This correspondence points out a new possible application for digital-voice communications. The use of digital-voice communications is proposed to extend the beyond-the-horizon range of high-altitude jet aircraft on over-water flights. The system would employ a Vocoder and a special purpose computer in conjunction with communications equipment now installed in aircraft used for extended-range communications. The Vocoder will digitize the regular voice transmission at a rate of 2400 bits/per sec, using an improved channel Vocoder. The special purpose computer will store the information and then retransmit it at a slower rate, resulting in narrow-band transmission from the transmitter. The range extension is the result of the slower rate of transmission and reception in a narrow band.

R 8

27,293

Kay, L. ULTRASONIC MOBILITY AIDS FOR THE BLIND. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 9-16. American Foundation for the Blind, New York, N.Y. (Lanchester College of Technology, Coventry, England).

Since the frequency modulation ultrasonic mobility aid was first described in its experimental form in 1962, preliminary trials have been carried out. The results of the trials were inconclusive, however it was felt that sufficient promise had been demonstrated to warrant the development of a handheld torch, based on the experimental unit which was well engineered, reliable and reasonably cheap. The torch weighs 9 ounces. Attached to it by a lead is the battery and the hearing aid ear piece. All the electronics are contained in the torch; they are designed to produce consistent results over a wide range of battery voltage and allow for the discharging of the battery. Several factors were involved in the decision regarding the range of the torch. The final choice was between 7 ft and 20 ft, selected by a push button. The remaining control is a combined on/off switch and volume control. A M transmission frequency of 60 kc/sec is used, producing a M beam width of 15°. The rate of change of frequency of transmission is arranged to produce an audible echo note of 3 kc/sec when the echoing object is at 20 ft or 7 ft (according to the range selected). Many blind organizations in several countries are purchasing the new aid with the object of carrying out evaluation trials. Some tests are to be carried out under controlled conditions with psychologists conducting them. Others will be on the basis of "try it and see." It is important that blind people be tested under varied conditions and over a long period of time. A hypothetical binaural ultrasonic mobility aid is briefly discussed. (HEIAS)

R 7

27,294

Nelkin, A. ULTRASONIC AID FOR THE BLIND. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 17-25. American Foundation for the Blind, New York, N.Y. (Westinghouse Research Laboratories, Pittsburgh, Penn.).

The system described in this paper uses ultrasonic energy for object detection as a mobility aid for the blind. It differs from other ultrasonic systems in 2 ways: first in that it automatically scans the volume ahead of the operator by use of multiple transducers, each looking at a specific conical volume; and second in that echo returns are presented to the operator tactually. The first experimental model uses 9 acoustic transducers in a square 3 by 3 array. It is expected that later models will use a larger array of acoustic transducers. The number will be limited by the amount of tactile information the operator can interpret intelligently. The tactile transducer, either electrical or pressure type, will be mounted on the operator's body in arrays positioned identically to the transducer array so that the spatial positioning of the acoustic and the tactile transducers will be the same. Thus, if a particular transducer receives an echo from an obstacle in the volume projected by its beam it will feed this signal to the corresponding tactile transducer, and the operator will know both which of the volumes is returning a signal and that an obstacle exists in that volume of space.

27,295

Starkiewicz, W. & Kuliszewski, T. PROGRESS REPORT ON THE ELEKTROFTALM MOBILITY AID. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 27-38. American Foundation for the Blind, New York, N.Y. (Pomeranian Medical Academy, Szczecin, Poland & Wrocław Technical University, Wrocław, Poland).

The elektroftalm is an apparatus to help the blind user to move about the lighted space which surrounds him. In contrast to other apparatus of the kind, with which the user can determine the approximate distance from an obstacle in a strictly determined direction, the Elektroftalm makes it possible to provide the blind user with a number of stimuli, each connected with the various directions of surrounding objects. The field of vision of the Elektroftalm is not large, for it falls in the range of 20 to 30 spherical degrees. The number of simultaneous stimuli is 120, so that the resolution is very low. Nevertheless, we feel the Elektroftalm may be a great help to the blind user in his attempt to orient in illuminated space. In general, the visual stimuli to which the eye react are transformed into a tactile stimulus field on the skin of the forehead of the blind user. In other words, the device transforms light radiation into mechanical energy. This is accomplished by means of the photoelectronic elements in the device. The shortcomings of the device are discussed. Efforts are being made to refine the design and construction of the device by reducing the number of parts, simplifying the design, and lowering its price. Two further proposals have been made. The first applies some current television techniques to the device; the second is a modification of the output of the device. These proposals are discussed in some detail.

R 1

27,296

Bishop, W.B. PASSIVE ENVIRONMENT SENSORS AND THEIR TRANSDUCERS. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 39-59. American Foundation for the Blind, New York, N.Y. (USAF Cambridge Research Labs., OAR, L.G. Hanscom Field, Bedford, Mass.).

Passive environment sensors, particularly those which make use of ambient light, can be exceedingly simple in design. In earlier papers the author concluded that sufficient information concerning one's environment could be obtained by such a sensor to permit a blind person to move about safely. Admittedly a great deal of learning is involved, and some Ss may react negatively to this. However, since a working model has been built and demonstrated, even skeptics agree that the passive sensor has possibilities. This paper explores some of the desired refinements for the passive sensor. The transducer for coupling information into the nervous system, in particular, is in need of improvement. Several possible improvements are suggested and the desirable characteristics of an ideal transducer are outlined. Considerable emphasis is placed on the manner in which an environment sensor should be tested. The ultimate test, in the author's opinion, would be to attach the sensor to a blind child, preferably by means of something resembling eyeglasses, and give him no instructions whatever concerning how it should be used. If the child can learn to sense his environment on his own volition, then the sensor is properly designed. If he cannot, then something is wrong with it. There are, of course, many intermediate tests which must be conducted before this final test can be made.

R 15

27,297

Bliss, J.C., Crane, H.D. & Gardiner, K.W. AN AMBIENT-LIGHT OBJECT DETECTOR AND ITS POTENTIAL EXTENSION TO CONVEY OBJECT SHAPE INFORMATION. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 61-71. American Foundation for the Blind, New York, N.Y. (Stanford Research Institute, Menlo Park, Calif.).

This paper discusses an experimental mobility device consisting principally of a wide area photocell placed behind a lens. With a nonuniform illumination field the photocell conductance depends on light distribution as well as total illumination as the photocell is moved away from the lens. Since the light distribution patterns are similar for symmetrical locations on either side of focus, the photocell conductance will have a local maximum or minimum at the in-focus image plane. For different object positions the local maximum will be shifted to the right or left corresponding to the shifts in image position. Different photocell signals are obtained for various object positions. Auditory and tactile outputs are available in the experimental model. The auditory output is a small earphone; the tactile output is a piezoelectric bimorph vibrating against the finger tip. The performance of the present model is discussed and potential improvements and extensions are suggested. In order to investigate the ability of people to perceive tactile images of simple geometric shapes or outlines, experiments have been conducted with arrays of up to 96 tactile stimulators. It was found that shapes as complex as the letters of the alphabet can be easily learned tactually. (HEIAS)

R 2

27,298

Russell, L. TRAVEL PATH SOUNDER. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 73-78. American Foundation for the Blind, New York, N.Y. (Cambridge, Mass.).

This paper discusses an ultrasonic probing device intended for use by cane travelers. The instrument is worn at the chest by means of a neck strap. The device emits short pulses of sound at 40 kc/sec (15 pulses per sec), inaudible, of course, to humans. Echoes are received from objects ahead of the user, and their range is established by a time delay measuring circuit within the instrument. When there are no echo producing objects ahead of him within 6 ft the device makes no audible sound. As an object is approached (another pedestrian for example) the detector begins making a clicking sound at the moment the object is 70 in. away. The loudness of the clicking increases according to an inverse range law as the object is approached and until it is within 30 in, at which time a beeping sound is emitted along with the clicks. The instrument is intended to complement the cane, not to replace it. One immediate benefit is to protect the walker from bumping into objects above the waist that the cane might miss, for example, a low branch or the tailgate of an unloading truck.

27,299

Chardon, G. A MOBILITY AID FOR THE BLIND. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 79-81. American Foundation for the Blind, New York, N.Y. (Druten, The Netherlands).

An experimental mobility device is briefly reported. The principle of the device is not new. In its simplest form there is an oscillator which produces such a frequency that the wavelength of the radiated wave beam is in the order of 1 or 2 cm. The velocity of propagation is not important: sound waves, ultrasound waves, or radio waves are all suitable. The wave is reflected from an obstacle, if present, and is heard again at the device output. There is thus, in the presence of an object, a distance reaction resulting in a 2-way coupling between sender and receiver--direct coupling electrically. Depending on the length of the wave, the resulting coupling will vary from maximum to minimum, and will differentiate the distance to the obstacle by half a wavelength. A small movement of the guide, a half-cm for example, is sufficient to tell the guided person that there is an obstacle in the direct vicinity. At large distances the noise disappears, for the detection path becomes equivocal. At near distances, the Doppler principle provides the means for the signal heard by the user. One of the most important features of the instrument is that it automatically differentiates between moving and stationary objects.

27,300

Muratov, R. THE FAMILIARIZATION OF THE BLIND WITH THE VISUAL CHARACTERISTICS OF SURROUNDING OBJECTS BY MEANS OF PHOTOELECTRIC DEVICES EQUIPPED WITH A SOUND SIGNALIZATION. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 83-95. American Foundation for the Blind, New York, N.Y. (Typhlo-technical Lab., Institute of Physical Defect, Sverdlovsk, Russia).

A portable photoelectric detector for the blind, with a changing tone signal output, named the phonoscope, has been designed by the author at the Sverdlov Typhlotechnical Laboratory of the Scientific Research Institute of Physical Defects of the Academy of Pedagogical Sciences of the RSFSR. The use of the phonoscope is very simple. After pressing the start button the device is directed by hand toward the object to be observed. First, in order to determine the location of the object, wide swings are made through the air by the arm holding the device. Then the shape of the object is outlined by small zigzag movements. When the line of sighting is displaced from the surface of the observed object to a background of different brightness, against which the shape of the object is projected, the pitch of the sound signal changes accordingly. Similarly, when aiming the device at a dark section of the surface of the object, a lower tone of the signal is heard and vice versa. A consecutive scanning of all points of the surface of the "observed" object is possible by systematic movement of the hand of the user.

27,301

Kohler, I. TWO SENSORY AIDS TO AUGMENT THE MOBILITY OF THE BLIND. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 191-197. American Foundation for the Blind, New York, N.Y. (Experimental Psychology Institute, University of Innsbruck, Innsbruck, Austria).

2 aids designed to augment the mobility of blind persons are described. The first is a sonic device which operates within the normal span of hearing of the human ear. In order to define the limits of the capacity to avoid obstacles the device was tested in the following situations: crossing a forest, in difficult mountain areas, swimming, and steering a cart. The second device is a vestibular stimulator to guide the traveler's direction of movement remotely. (HEIAS)

R 7

27,302

Kolers, P.A. SOME GENERAL REMARKS ON MOBILITY INSTRUMENTATION RESEARCH. Report from: "Proceedings of the Rotterdam Mobility Research Conference, Rotterdam, The Netherlands, 3-7 August 1965." May 1965, 235-241. American Foundation for the Blind, New York, N.Y. (Massachusetts Institute of Technology, Cambridge, Mass.).

This critique was written in response to the papers presented at the Rotterdam Mobility Research Conference. The author suggests that present mobility devices are naive in that they are based on several false assumptions. One such assumption is that the various senses of man are equivalent in terms of their information processing abilities. Another assumption inherent in the types of mobility devices presently in use is the necessity of giving physical range information to the blind. This presupposes that our perception of objects is built up out of a series of very primitive physical dimensions. What seems to be implied is that one would enhance the orientation and mobility of the blind if one could provide more dimensions of information. The author feels that the information supplied by present devices is largely irrelevant. He suggests that the perception of the sighted is categorical in nature, i.e., we see objects in terms of their category memberships. It is suggested that aids to the blind should simulate what the sighted do and provide information about what an object is. Studies should be made of what the blind want to know. The paper concludes with a brief discussion of what the author feels to be truly relevant studies in this area. (HEIAS)

27,303

Sander, H.J. ORGANIZATIONAL BEHAVIOR IN A DISASTER STRESS SITUATION. Research Rev., Dec. 1965, IV(10), 28-29. (USAF Office of Scientific Research, ARDC, Washington, D.C.).

The value of studying organizations under stress is that such research can so well reveal the structure and function of all types of such groups. The Ohio State Disaster Research Center's program is briefly described in terms of its 3 concurrent phases: field studies, e.g. earthquakes in Alaska and Japan, dam breaks in Italy and California; intermediate investigations, e.g. crisis situations over which there is some control; and laboratory simulation, e.g. the communications group of a police department and various simulated emergencies.

27,304

Wagoner, D.E. SURVIVAL OF THE FITTED. Infantry, March-April 1965, 55(2), 7-8.

As an occupational hazard the Infantryman is exposed to all environmental and climatic conditions and may be forced to rely on his own resources at any time. The survival kits available to him are too bulky; most are designed to be carried in a vehicle or aircraft. This paper suggests that since no acceptable survival kit exists to meet the special needs of the Infantryman, he can and should make his own. 3 categories of items in a survival kit are discussed: a) Essential items: Water purification means (tablets, or container for boiling water); Water storage capability (polyethylene bags or canteen); Fire making equipment; Salt; Thread; Needle; Small Fish Hooks; Insect repellent; Antibiotics; Adhesive tape; Knife; Sharpening stone; b) Desirable items: Saw; Needle-nosed pliers; Signalling device (metal mirror); Food (candy etc.); c) Area items: Fungicidal preparations (tropical areas); Chapstick (arctic areas).

27,305

Guelzo, C.M. THE AIR-GROUND PROBLEM. Infantry, Jan.-Feb. 1965, 55(1), 20-25.

The capabilities of the USAF to provide combat missions are: For air tactical missions: a) air superiority--fighter sweep, bombing, escort, combat air patrol, interception; b) interdiction; c) Close air support--column cover, bombing, ground attack; d) Special--electronic warfare, psychological warfare, battlefield illumination. For air reconnaissance missions: a) Visual--area search, specific search, route reconnaissance, artillery adjustment, contact reconnaissance; b) Photo--area coverage, special cover, map supplement, mapping & charting; c) Special--electronic, weather. Possibly the most annoying feature of any system of air-ground cooperation which translates these capabilities into actual missions is the lack of control the Army exercises over the manner in which its allocated air support effort is expended.

27,306

Black, J.W. COMMUNICATION BY VOICE. Naval Res. Rev., Feb. 1965, XVIII(2), 7-14. (Speech Dept., Ohio State University, Columbus, Ohio).

This article discusses 3 general findings from voice communication studies: the lawfulness about the intelligibility of words--that the more intelligible has more sounds and syllables and is spoken more frequently, that a word's recognizability is somewhat predictable and its intelligibility is improved in context; the interdependence of speaking and listening abilities--that better listeners also are more intelligible speakers; and that training can improve both oral and aural communication.

27,308

Naval Research Reviews. FOUR YOUNG MEN IN A LONG, SLOW SPIN. Naval Res. Rev., March 1965, XVIII(1), 14-16. (Superintendent of Documents, US Government Printing Office, Washington, D.C.).

As part of a study of the effects on humans of conditions that would exist in a spacecraft set in rotation to produce artificial gravity, 4 Navy men were subjected to 28 days of spinning. Home and laboratory for the volunteers during the period was the Coriolis Acceleration Platform, a windowless, rotating room that is 20 feet in diameter and 10 feet high. The long journey began at a speed of 2 revolutions per minute. Every 2 days this speed was increased 1 rpm until a velocity of 10 rpm was reached--the maximum for this experiment. Throughout the run, a group of scientists and doctors observed the reactions of the men closely by means of psychological and biochemical tests. A subject of special interest investigated by means of the tests was nystagmus which often occurs in a rotating environment. No specific data are included in the report.

R 0

27,309

Naval Research Reviews. GAKU: A COMPUTER SYSTEM THAT LEARNS TO SOLVE PROBLEMS BY EXPERIENCE. Naval Res. Rev., April 1965, XVIII(4), 15-16. (Superintendent of Documents, US Government Printing Office, Washington, D.C.).

This article briefly describes a computer system, being developed, which can learn to handle increasingly complex tasks by using its own past experience plus human guidance. It is a partnership formed between a digital computer and man. It differs basically from the conventional method of using a computer in that it utilizes instructions and procedures of a more general nature that can apply to a wide variety of problems. Gaku has 4 major components: a programming mechanism, a problem-oriented mechanism, a planning mechanism, and an induction mechanism.

27,310

Melson, L.B. MILITARY AND CIVILIAN IMPLICATIONS OF MAN'S UNDERWATER OPERATIONS. Naval Res. Rev., May 1965, XVIII(5), 1-6. (USN Applications Group, ONR, Washington, D.C.).

In spite of the tools and facilities available for entering the oceans, man has only just recently become able to live within the ocean independently of surface support. Eventually, systems will be designed that will permit the personnel that will inhabit the underwater dwelling to leave the surface under their own power, maneuver the structure to the exact location on the bottom where they wish to reside, and anchor it in place. The structure will be mobile for ascent and descent, be fully equipped to support its crew for periods of up to 2 or 3 months, be capable of pressurization during the transiting periods, and be capable of operations that are independent of any unit on the surface. Until the habitat can be freed from all umbilical ties with the surface or the shore, the full potential of the habitat cannot be realized. Some of the implications of man's occupation of the sea's depths are discussed.

27,311

Naval Research Reviews. ULTRASONIC HEARTBEAT MONITOR. Naval Res. Rev., May 1965, XVIII(5), 10-11. (Superintendent of Documents, US Government Printing Office, Washington, D.C.).

An electronic device capable of monitoring the heartbeat of human embryos as early as 10 weeks after conception is being used by physicians at the National Naval Medical Center in Bethesda, Maryland. The device, called the Ultrasonic Doppler Cardioscope (UDC), emits a narrow beam of high-frequency sound, the echo of which provides a means of detecting the tiny motion of the unborn baby's heart. The UDC can also keep an accurate check on the unborn infant's heart during delivery, which no other device available currently can do. Although the UDC is still in the developmental stage, physicians believe that it may prove to be valuable, in addition, in the study of cardiovascular diseases in adults. The advantages of this device are briefly enumerated.

27,312

Parker, J.F., Jr. FLASH BLINDNESS. Naval Res. Rev., Aug. 1965, XVIII(8), 1-7. (BioTechnology, Inc., Arlington, Va.).

For a number of years, the Office of Naval Research has been concerned about the impairment of vision which occurs when airmen and other military personnel are exposed to intense visible radiation. For example, if nuclear weapons are exploded in military conflicts of the future, many men responsible for the success of important missions may be incapacitated by the ensuing visible radiation. For this reason, ONR has initiated and sponsored a study of the problem. In the following article, the director of that study, which is continuing, reports on the problem, our present understanding of it, and the measures being taken to protect men against it.

27,313

Naval Research Reviews. ONR PHYSIOLOGICAL RESEARCH FOR MAN-IN-THE-SEA. Naval Res. Rev., Aug. 1965, XVIII(8), 11-16, p23. (Superintendent of Documents, US Government Printing Office, Washington, D.C.).

Project Sealab II is being undertaken, in part, to explore some of the physiological obstacles to man's free-swimming penetration of the ocean depths. The most difficult of these obstacles are discussed here: a) Inert gas narcosis; b) Decompression; c) Carbon-dioxide retention; d) Body heat loss; e) Effect on the heart.

27,314

Talmadge, H.G., Jr. & Orsino, R.J. SPAD - AN EXPERIMENTAL SATELLITE POSITION PREDICTION DISPLAY. Naval Res. Rev., Sept. 1965, XVIII(9), 9-12. (USN Research Lab., Data Processing Branch, Washington, D.C.).

This article describes briefly the Satellite Position Display equipment which will make available to shipboard personnel information concerning a particular satellite or category of satellites (e.g. communication, weather, navigation, scientific). Operating upon orbital elements and related information received from a space tracking facility, a model AN/UUK-1 computer selects up to 10 satellites, from a store containing information on 88 satellites, predicts their position and height, along with the position of the interested ship, and within one second displays this information on a rectangular world map (a modified Mercator projection) consisting of longitude and latitude grid lines and the principal geographic profiles.

27,315

Bosee, R.A., Post, T.J. & Parker, J.F., Jr. THE IMPROVEMENT OF NAVY LIFE-SUPPORT HELMETS. Naval Res. Rev., Sept. 1965, XVIII(9), 13-19. (USN Bureau of Naval Weapons, Washington, D.C.).

This article reviews recent efforts of the Navy to develop more effective life-support helmets for Naval aviators. Some important functions of such helmets include: impact-protection, O<sub>2</sub> provisions, burn protection, windblast and implosion protection, communications equipment provisions, and thermal radiation and visible energy from nuclear detonation protection. The recommendation that a family of helmets, rather than one for all classes of aircraft, be developed is being implemented. 3 helmet types accordingly are being evaluated: for attack and fighter pilots, for patrol plane pilots, and for helicopter crewmen. A fourth study is concerned with helmet fit and comfort.

27,316

Smith, A.H. & Kelly, C.F. BIOLOGICAL EFFECTS OF CHRONIC ACCELERATION. Naval Res. Rev., Nov. 1965, XVIII(11), 1-11, p33. (Animal Physiology Dept., University of California, Davis, Calif.).

2 centrifuges at the University of California at Davis have logged more than 40 million revolutions in studies of the effects of changes in weight on experimental animals. Some of the results of this work are discussed here. The following topics are discussed: a) Centrifugation; b) Research approach to chronic acceleration; c) "Chronic acceleration sickness"; d) Physiological adaptation; e) Responses to chronic acceleration; f) Predicting effects of weightlessness.

27,317

Naval Research Reviews. SEALAB II: A SUMMARY REPORT. Naval Res. Rev., Nov. 1965, XVIII(11), 12-16. (Superintendent of Documents, US Government Printing Office, Washington, D.C.).

Highlights of the successful 45-day residence (summer 1965) by 3 relay teams of Navy and civilian divers on the floor of the Pacific Ocean are presented here. For the first time, numerical data on human performance in accomplishing work in cold, dark water were obtained. An intensive study of diver physiology was carried out. By means of questionnaires and TV monitoring close attention was paid to diver behavior. Many photographs are included in this brief article.

27,318

Sargent, M.C. THE SCRIPPS INSTITUTION OF OCEANOGRAPHY. Naval Res. Rev., Dec. 1965, XVIII(12), 1-11. (Scripps Institution of Oceanography, La Jolla, Calif.).

This article--the first of a series on major oceanographic institutions supported by the Office of Naval Research--describes some of the highly significant investigations conducted by Scripps during the last 2 decades. Topics discussed include: a) History of the institution; b) Present organization; c) Scientific work--with emphasis upon research concerning surface waves, currents, internal waves, physiography of the sea floor, and fisheries studies; d) Consultant services. Equipment developed by the institution is briefly discussed.

27,319

Dye, D.L. & Wilkinson, M. RADIATION HAZARDS IN SPACE. Science, Jan. 1965, 147(3653), 19-25. (Boeing Company, Seattle, Wash.).

The aim of this paper is to present the results of calculations of the amount of radiation from protons trapped in the earth's magnetic field or emitted in solar flares that is absorbed at various points in the body of a human being, seated in a spherical shell vehicle, the body tissues themselves being considered part of the shielding. The method allows planners of a space mission to evaluate the hazard in terms of allowable dose to the most sensitive organ, on the basis of specific mission and vehicle parameters. Reasonable tolerance-dose values must be established. This approach also allows one to view the risks from radiation in perspective relative to the other hazards of space travel. (HEIAS)

R 22

27,320

Carterette, E.C., Friedman, M.P., Lindner, W. & Pierce, Jean. LATERALIZATION OF SOUNDS AT THE UNSTIMULATED EAR OPPOSITE A NOISE-ADAPTED EAR. Science, Jan. 1965, 147(3653), 63-65. (Psychology Dept., University of California, Los Angeles, Calif.).

Conditions of monaural stimulation under which a sound image can be located toward the contralateral, unstimulated ear have been discovered; the phenomenon helps to clarify divergent experimental results. A tentative model is presented, together with some testable psychophysiological consequences.

R 23

27,321

Beh, H.C. & Barratt, P.E.H. DISCRIMINATION AND CONDITIONING DURING SLEEP AS INDICATED BY THE ELECTROENCEPHALOGRAM. Science, March 1965, 147(3664), 1470-1471. (Psychology Dept., University of New England, Armidale, New South Wales, Australia).

In Exp. I the investigators attempted to "build-in" stimulus significance during wakefulness by means of conditioning, and to test for discrimination of the conditioned stimulus during sleep. After habituation 10 experimental Ss received presentations of a 500-cy/sec tone paired with pulsed shock (6 pulses/sec) to the right forefinger at a level "painful" to the S. These presentations were interspersed with 10 presentations of both the 500 cy/sec tone and a 300 cy/sec tone alone. The 10 control Ss underwent the same procedure except that neither of the tones was ever paired with the shock. The goal of Exp. II was to build-in stimulus significance during sleep of medium depth, and to test for discrimination of the conditioned stimulus both during and after sleep. In this experiment the 300 cy/sec tone was selected as the stimulus to be paired with the shock for conditioning. The same conditioning schedule as for the first experiment was used. The findings indicate that it is not only possible for the human organism to discriminate between stimuli during sleep on the basis of their significance, but that stimulus significance "built-in" during sleep appears to carry over to the waking state.

R 7

27,322

Simmons, F.B., Epley, J.M., Lummis, R.C., Guttman, N., et al. AUDITORY NERVE: ELECTRICAL STIMULATION IN MAN. Science, April 1965, 148(3666), 104-106. (Otolaryngology Div., Stanford University School of Medicine, Stanford, Calif.).

Auditory perceptions produced in a person deaf to acoustic stimulation were studied by electrically exciting the auditory nerve through permanently implanted electrodes. Pulsed current as small as 1 microampere peak-to-peak could be perceived. Pitch, as reported by the S, varied with electrode selection, current amplitude, and pulse repetition rate from about 70 to at least 300 pulses per sec. Loudness increased with amplitude and duration of pulse stimuli, and to a lesser extent with repetition rate. The total range in amplitude of the stimulus, from threshold to an uncomfortable loudness, was 15 to 20 db. Simultaneous stimulation in separate electrodes produced a number of complex effects.

R 13

27,323

Spong, P., Haider, M. & Lindsley, D.B. SELECTIVE ATTENTIVENESS AND CORTICAL EVOKED RESPONSES TO VISUAL AND AUDITORY STIMULI. *Science*, April 1965, 148(3668), 395-397. (Psychology & Physiology Depts., University of California, Los Angeles, Calif.).

Cortical evoked responses to flashes and clicks were recorded from human Ss performing visual or auditory tasks under 3 conditions of selective attentiveness. The 13 Ss were required to attend to the flashes and to ignore alternating clicks, or vice versa. Responses to flashes recorded from the occipital area were larger when attention was directed toward visual stimuli, and responses to click stimuli recorded from the temporal area were larger when attention was directed toward auditory stimuli.

R 10

27,324

Morant, R.B. & Beller, H.K. ADAPTATION TO PRISMATICALLY ROTATED VISUAL FIELDS. *Science*, April 1965, 148(3669), 530-531. (Psychology Dept., Brandeis University, Waltham, Mass.).

The aftereffects of viewing a tilted field of lines differ from the effects of viewing a tilted field of objects. The difference is attributed to the fact that unlike isolated lines, objects have specifiable normal orientations.

R 13

27,325

Suppes, P. & Schlag-Rey, Madeleine. OBSERVABLE CHANGES OF HYPOTHESES UNDER POSITIVE REINFORCEMENT. *Science*, April 1965, 148(3670), 661-662. (Mathematical Studies in the Social Sciences Institute, Stanford University, Stanford, Calif.).

In mathematical models of concept learning it has consistently been assumed that positive reinforcement cannot lead to a change of the hypothesis determining the overt response. When hypotheses are experimentally identified and recorded along with positive and negative reinforcements of S-R pairs, it can be shown that hypotheses may change after a positive reinforcement. Positive reinforcement has an information content for Ss that has not yet been adequately recognized in concept formation studies.

R 5

27,326

Bartlett, N.R. & White, C.T. EVOKED POTENTIALS AND CORRELATED JUDGMENTS OF BRIGHTNESS AS FUNCTIONS OF INTERFLASH INTERVALS. *Science*, May 1965, 148(3672), 980-981. (University of Arizona, Tucson, Ariz. & USN Electronics Lab., San Diego, Calif.).

Computer-averaged evoked potentials were recorded from Ss presented with pairs of flashes having equal light energy but differing in duration of the brief interval separating the flashes. For the experimental conditions studied, the pair was always subjectively fused. Although the brightness did not change noticeably as the interval was varied, the use of the forced-choice psychophysical technique showed that apparent brightness declined with increase in the interval. Analysis of the evoked potentials revealed a correlated change in amplitude and wave form previously demonstrated for changes in flash flux alone.

R 4

27,327

Rice, C.E. & Feinstein, S.H. SONAR SYSTEM OF THE BLIND: SIZE DISCRIMINATION. *Science*, May 1965, 148(3673), 1107-1108. (Stanford Research Institute, Menlo Park, Calif.).

We have tested the ability of a group of 4 blind Ss under uniform testing conditions to make size discriminations by using echoes. Measures were obtained as to how much of a difference in size must exist between 2 similarly shaped targets before one is judged as larger or smaller than the other. The echo-information was obtained from vocalizations produced by the Ss. The results obtained can be said to represent one measure of echo-acuity of the blind. The Ss were tested at 3 distances from the targets: 24 in (60.96 cm), 36 in (91.44 cm), and 48 in (121.92 cm) so that information on the effect of distance and auditory angle upon the size discrimination could be obtained. At each distance, a range of 5 target sizes was presented to the S by the method of constant stimuli. The middle-sized target of the range was designated as a standard stimulus. This standard was randomly compared with itself and each of the other targets until each pairing had occurred 60 times. Threshold estimates indicate that objects with area ratios as low as 1.07/1 could be discriminated.

R 5

27,328

Shagass, C. & Schwartz, M. AGE, PERSONALITY, AND SOMATO-SENSORY CEREBRAL EVOKED RESPONSES. *Science*, June 1965, 148(3675), 1359-1361. (Psychiatry Dept., State University of Iowa, Iowa City, Iowa).

In this report evidence was presented that age and a personality factor, designated as "extraversion" in the Maudsley Personality Inventory (1), contribute significantly to inter-individual variation of somatosensory responses in healthy persons. Cerebral responses to stimulation of the median nerve were recorded in 89 healthy Ss, aged 15 to 80 yrs. Relationships between response characteristics, age, sex, and Maudsley Personality Inventory variables were determined. Amplitudes increased significantly with age. Age interacted with "extraversion" so that more "extraverted" Ss under 20 and fewer "extraverted" Ss over 40 had larger responses.

R 8

27,329

Matin, L. & Pearce, D.G. VISUAL PERCEPTION OF DIRECTION FOR STIMULI FLASHED DURING VOLUNTARY SACCADIC EYE MOVEMENTS. *Science*, June 1965, 148(3676), 1485-1488. (New York University, Bronx, N.Y. & Defense Research Medical Labs., Toronto, Ontario, Canada).

In 2 different experiments, Ss reported on the visual direction of a flash presented during a voluntary saccade relative to the visual direction of a stimulus viewed prior to the saccade. Under the conditions of the first experiment the report given by the S was primarily determined by the relative retinal positions of the 2 stimuli. In the second experiment evidence was obtained for precisely timed shifts in local signs which are due to proprioceptive compensation for changes in ocular position during the saccade.

R 3

27,330

McCormack, P.D. & Haultrecht, E.J. TWO-STAGE PAIRED-ASSOCIATE LEARNING AND EYE MOVEMENTS. Science, June 1965, 148(3678), 1749-1750. (Psychology Dept., Carleton University, Ottawa, Ontario, Canada).

Eye movements of 20 male students were photographed continuously throughout the course of their learning verbal paired-associates. As learning progressed, proportionately less and less time was spent scanning the response when the stimulus and response were presented together. These findings are interpreted as supporting a 2-stage theory of verbal learning.  
R 4

27,331

Siegfried, J.B., Tepas, D.I., Sperling, H.G. & Hiss, R.H. EVOKED BRAIN POTENTIAL CORRELATES OF PSYCHOPHYSICAL RESPONSES HETEROCHROMATIC FLICKER PHOTOMETRY. Science, July 1965, 149(3681), 321-323. (Systems & Research Div., Honeywell, Incorporated, St. Paul, Minn.).

The relation between the amplitude of evoked brain potentials in man and the relative luminance of 2 flicker components of different color was determined. The function, which is U-shaped, has a minimum which occurs near the point of equal luminance as judged by the psychophysical method of flicker photometry.  
R 8

27,332

Barlow, H.B. VISUAL RESOLUTION AND THE DIFFRACTION LIMIT. Science, July 1965, 149(3683), 553-555. (Neurosensory Lab., University of California School of Optometry, Berkeley, Calif.).

Movement of a grating behind a fixed aperture can be detected by human Ss when the grating is well below the diffraction limit of the pupil and below acuity measured with stationary gratings. With movement one sees a flicker or ripple at the edges, and it is argued that these edge effects lead to spurious estimates of optical resolution in insects and man.  
R 10

27,333

McCollough, Celeste. COLOR ADAPTATION OF EDGE-DETECTORS IN THE HUMAN VISUAL SYSTEM. Science, Sept. 1965, 149(3688), 1115-1116. (Psychology Dept., Oberlin College, Oberlin, Ohio).

An aftereffect of color which depends on the orientation of lines in the test field may be obtained by presenting a horizontal grating of one color alternately with a vertical grating of a different color. Like the aftereffect of adaptation to chromatic fringes produced by prismatic spectacles, this aftereffect is visible in monochromatic light and fails to show interocular transfer. It is suggested that both effects are to be understood in terms of color adaptation of orientation-specific edge-detectors.  
R 7

27,334

Meizack, R. & Wall, P.D. PAIN MECHANISMS: A NEW THEORY. Science, Nov. 1965, 150(3699), 971-979. (Psychology Dept., McGill University, Montreal, Quebec, Canada & Biology Dept., Massachusetts Institute of Technology, Cambridge, Mass.).

There are currently 2 opposing theories of pain: specificity theory, which holds that pain is a specific modality like vision or hearing, "with its own central and peripheral apparatus," and pattern theory, which maintains that the nerve impulse pattern for pain is produced by intense stimulation of nonspecific receptors since "there are no specific fibers and no specific endings." Both of these theories are further described and evaluated in terms of clinical, psychological, and physiological evidence. The strong points of both theories are discussed and integrated into a new theory of pain mechanisms: Gate control theory. This theory generally proposes a gate control system which modulates sensory input from the skin before it evokes pain perception and response. It is suggested that pain phenomena are determined by interactions among 3 spinal cord systems. These systems are discussed at length. In conclusion the theory is evaluated in terms of its adequacy in accounting for the clinical, psychological, and physiological evidence mentioned above.  
R 78

27,335

Thomas, E. & Thomas, P. VALIDATION OF THE 1962 NAVY COLLEGE APTITUDE TEST. Proj. PF01605040152, Tech. Bull. STB 66 6, Aug. 1965, 30pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 619990)

This study investigated the validity of the 1962 edition of the Navy College Aptitude Test (NCAT) as a predictor of Grade Point Average (GPA) and Naval Science Grade (NSG) in the freshman year of college. The validities of High School Rating (HSR), NROTC Questionnaire, Interviewers' Appraisal of Motivation, and the Verbal and Mathematical scores of the Scholastic Aptitude Test (SAT) were also determined. The sample included 1252 Regular NROTC midshipmen attending 52 colleges and universities throughout the United States. Validities of the individual and experimental NCAT subtests ranged from .20 to .34 when predicting GPA, and from .09 to .26 when predicting NSG. The NCAT Operational Score correlated .36 with GPA and .23 with NSG. HSR was the most valid predictor both singly and in combination with the NCAT. The NROTC Questionnaire and Interviewers' Appraisal were less predictive and, in some cases, negatively correlated with the criteria. Comparisons with the previous year's edition of the NCAT demonstrated a consistency in the validity of the best and poorest subtests and revealed that the later 1962 NCAT was the more valid instrument. The incorporation of the experimental Spelling subtest as an operational part of future editions of the NCAT was recommended because of its significant validity. It was suggested that the NCAT Selection Score be raised to the 60th percentile and that the selection of applicants with HSRs below 4 be curtailed. In an effort to improve the predictive validity of the battery it was recommended that more precise techniques be applied in future subtest construction and revision.  
R 9

27,336

Shipley, T., Jones, R.W. & Fry, Amelia. EVOKED VISUAL POTENTIALS AND HUMAN COLOR VISION. Science, Nov. 1965, 150(3700), 1162-1164. (Bascom Palmer Eye Institute, University of Miami School of Medicine, Miami, Fla.).

There is a long history of attempts to develop objective means for gauging individual differences in color vision. Some laboratories are now studying evoked occipital potentials. The occipitogram reflects primarily foveal luminosity characteristics and may bear a closer relationship to visual psychophysics than any other electrophysiological measure. Results obtained from 3 highly trained observers are given. The waveform of the evoked visual potential is color specific. This specificity is absent in the 1 color-deficient observer. (HEIAS)  
R 7



27,337

Krauskopf, J. & Srebro, R. SPECTRAL SENSITIVITY OF COLOR MECHANISMS: DERIVATION FROM FLUCTUATIONS OF COLOR APPEARANCE NEAR THRESHOLD. *Science*, Dec. 1965, 150(3702), 1477-1479. (Behavioral Research Institute, Silver Spring, Md. & USA Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.).

A method for determining the spectral sensitivity of the different color mechanisms of the human eye uses the pattern of color names applied to small, brief, dim, monochromatic flashes. Such responses are often due to the activation of single neural units. Preliminary spectral sensitivity curves for 2 color mechanisms have been obtained.

R 4

27,338

Brebbia, D.R. & Altshuler, K.Z. OXYGEN CONSUMPTION RATE AND ELECTROENCEPHALOGRAPHIC STAGE OF SLEEP. *Science*, Dec. 1965, 150(3703), 1621-1623. (Respiration & Metabolism Lab., Rockland State Hospital, Orangeburg, N.Y.).

In 5 male Ss, and a total of 15 man-nights,  $O_2$  consumption rate ( $V_{O_2}$ ) was related to stage of sleep, as defined by electroencephalograms. Gross periodic variations which paralleled change in stage of sleep were discernible in analogue metabolic records. Computations revealed significant differences ( $P < .01$ ) between all stages with  $V_{O_2}$  highest in stage I REM (dreaming sleep), least in stages III and IV (deep sleep), and intermediate in stage II (light sleep).

R 13

27,339

Schuckman, H. & Orbach, J. DETECTION THRESHOLDS AS A FUNCTION OF INTERVAL SEPARATION BETWEEN TWO SUCCESSIVE TARGETS. *Science*, Dec. 1965, 150(3703), 1623-1625. (Psychosomatic & Psychiatric Research & Training Institute, Michael Reese Hospital, Chicago, Ill.).

Detection thresholds for 2 successive targets varied systematically with the interval between the 2 pulses. At intervals of 10 to 30 msec, and again at 80 to 200 msec, the threshold was lowered as compared to that for a single target, while at a separation of 50 to 60 msec, the threshold was raised.

R 12

27,340

Bindra, D., Williams, Judith A. & Wise, J.S. JUDGMENTS OF SAMENESS AND DIFFERENCE: EXPERIMENTS ON DECISION TIME. *Science*, Dec. 1965, 150(3703), 1625-1627. (Psychology Dept., McGill University, Montreal, Quebec, Canada).

When asked to judge whether 2 stimuli (tones) were the "same" or "different," Ss took longer to decide that 2 identical stimuli were the same than to decide that 2 dissimilar stimuli were different. Thus these judgments are not equivalent obverse aspects of a unitary judgmental process. While decision theory can be extended to deal with the obtained data, a model based on an analogy with a statistical computer is more directly applicable.

R 8

27,341

Webb, W.B. & Agnew, H.W., Jr. SLEEP: EFFECTS OF A RESTRICTED REGIME. *Science*, Dec. 1965, 150(3704), 1745-1747. (Psychology Dept., University of Florida College of Arts & Sciences, Gainesville, Fla.).

5 "stages" of sleep can be reliably identified by the use of the EEG. The stages are designated as 1, 1-REM (accompanied by rapid eye movements), 2, 3, and 4. It is reasonable to hypothesize that these various stages make different, or unequal, contributions in accomplishing the purpose or purposes of sleep. The present experiment was designed to test indirectly the value of the various stages of sleep. 8 young male Ss were permitted to sleep only 3 hours out of each 24 for 8 days. It was reasoned that the organism would selectively sleep in or "choose" those states which were dominant in the hierarchy of sleep need. Electroencephalographic recordings were made during the 3-hour period of sleep. There was an increase in the amount of deep sleep (stage 4) during this period. On a recovery night, the first 6 hours revealed a significant increase in deep sleep, and beyond this period there was a sharp increase in stage 1-rapid eye movement sleep.

R 7

27,342

Pulscak, M.W., Cleveland, R.H., Hardy, R.W., Raphaelson, E., et al. THE CAPRI SYSTEM FOR NAVAL PERSONNEL PROGRAM MANAGEMENT. VOLUME I. DESCRIPTION AND OPERATION. Contract Nonr 3949(00), ORI Tech. Rep. 322, Rep. ND 65 28, May 1965, 199pp. USN New Development Research Branch, Bureau of Naval Personnel, Washington, D.C. (Operations Research, Incorporated, Silver Spring, Md.).

During the current phase of the Computerized Advanced Personnel Requirements and Inventory (CAPRI) development and implementation program, the operational system design was reviewed, approved, programmed, and installed on the Bureau of Naval Personnel's IBM 7080-1401 computers. The CAPRI System is currently being applied to the management of approximately 25 weapon systems. The system described in this report was developed to provide the Bureau of Naval Personnel (BuPers) with a management tool for efficient and effective planning, development, production, and control of personnel required to support both new and operational naval weapon systems. The system operates under the concept of and organization for PS program management within the bureau. The volume describes the Personnel Subsystem life cycle which parallels the weapon system life cycle. This spans the period from the issuance of a General Operational Requirement (GOR) to the phase-out of the last operational model of the system or until such time as the operation and maintenance of the weapon system becomes so routine that the PS can no longer be uniquely identified by special Navy Enlisted Classifications (NECs). 2 distinct CAPRI subsystems are described: the Network Planning and Analysis (NP&A) Subsystem and the Billets and Inventory (B&I) Subsystem.

R 16

27,343

Pulscak, M.W., Raphaelson, E., Hardy, R.W. & Cleveland, R.H. THE CAPRI SYSTEM FOR NAVAL PERSONNEL PROGRAM MANAGEMENT. VOLUME II. DATA-PROCESSING MANUAL. Contract Nonr 3949(00), ORI Tech. Rep. 322, Rep. NO 65 29, May 1965, 105pp. USN New Development Research Branch, Bureau of Naval Personnel, Washington, D.C. (Operations Research, Incorporated, Silver Spring, Md.).

Section I of this volume provides a description of the CAPRI System operation with regard to the Network Planning and Analysis (NP&A) Subsystem and the Billets and Inventory (B&I) Subsystem. Section II emphasized the production scheduling procedures required for system operation under each processing mode: weapon system or rating. A description of each computer program is provided, including purpose of the run, operator's instructions, inputs, outputs, and scheduling considerations. Detailed procedures summarizing the operational requirements of the system under each mode for normal operation and the procedures for adding or changing CAPRI weapon system or rating programs are included in the appendixes.

27,344

Wells, B.W.P. SUBJECTIVE RESPONSES TO THE LIGHTING INSTALLATION IN A MODERN OFFICE BUILDING AND THEIR DESIGN IMPLICATIONS. Build. Sci., Jan. 1965, 1(1), 57-68. (Building Science Dept., University of Liverpool, Liverpool, England).

The study set out to examine 2 commonly held beliefs about the physiological importance of daylighting, and the need to be able to see out of a building, and to establish the degree of accuracy with which the average person was aware of the presence or absence of daylight as an illuminant at a variety of distances from the nearest window. It was found that the strength of beliefs about daylighting and view were independent of physical context, that is, the respondent's working distance from the nearest window, and that people tended to overestimate the proportion of daylight that they had to work by at increasing distances from the windows. The authors of PSALI (Permanent Supplementary Artificial Lighting Installation) have made the assumption in relation to office design that daylighting should be the dominant source of lighting of a room in physical terms. However, the present experiment showed that people's estimates of the level of daylight illumination were far from accurate, and that they still felt that they had a considerable proportion even when there was scarcely any. The estimates that they made were shown to be based upon apparent brightness judgements, in turn dependent upon considerations of distance from the windows, and not the presence of daylight as an illuminant. It therefore appears that when considering the provision of adequate daylighting to meet the subjective needs of the user, these needs should be assessed, not in terms of physical measurements of the proportion of daylight to artificial light, but in terms of the psychological considerations.

R 10

27,345

Langdon, F.J. A STUDY OF ANNOYANCE CAUSED BY NOISE IN AUTOMATIC DATA PROCESSING OFFICES. Build. Sci., Jan. 1965, 1(1), 69-78. (Building Research Station, Garston, Herts, England).

Noise levels were measured in 3 types of office room and occupants assessments recorded on a questionnaire containing a 7-point rating scale together with comparative questions relating noise to other environmental variables. Noise was found to be the most important single source of annoyance, and noise levels were rated too high to be regarded as satisfactory in more than half of the rooms studied. Degree of annoyance was found to be related to noise level, with significant differences between occupational grades leading to a concept of noise level expectancies for different occupations. The possibilities of damage to hearing and interference with speech communication are considered and maximum noise levels for both speech conservation and comfort are suggested. The problem of noise control in offices is discussed and the results of an experiment reported together with general suggestions for the treatment of mechanized offices.

R 7

27,346

Raychaudhuri, B.C., Ali, S. & Garg, D.P. INDOOR CLIMATE OF RESIDENTIAL BUILDINGS IN HOT ARID REGIONS--EFFECT OF ORIENTATION. Build. Sci., Jan. 1965, 1(1), 79-88. (Central Building Research Institute, Roorkee, India).

This paper presents the results of a year-round experimental investigation carried out to study the effect of orientation on the indoor thermal conditions of 32 occupied dwellings of similar plans and design specifications but having 8 different orientations. Matrix method of computation was also used for predicting the indoor temperatures. From both the experimental observations and the theoretical computations, it is found that the dwellings facing south-east and south directions have better indoor climatic environment throughout the year. The observed effective temperatures are found to be within the comfort zones only during the winter afternoons while for the rest of the periods of observation in the year, it is beyond the comfort zones in all the houses.

R 6

27,347

Wells, B.W.P. THE PSYCHO-SOCIAL INFLUENCE OF BUILDING ENVIRONMENT. SOCIOMETRIC FINDINGS IN LARGE AND SMALL OFFICE SPACES. Building Science, Sept. 1965, 1(2), 153-165. (Psychology Dept., University of Strathclyde, England).

In an earlier paper in 'Building Science' attention was drawn to the advantages of deep office spaces and how these may be satisfactorily attained. It was pointed out, though, that deep blocks will probably, because of the requirements of a view from the building and the view of daylight, require most office spaces to be large and open planned. This paper is concerned with describing some of the psycho-social consequences of opting for large or small areas.

R 18

27,348

McKiever, Margaret F. THE HEALTH AND SAFETY OF WOMEN WHO WORK. Nat. Safety News, Nov. 1965, 92(5), 24-27. (US Health, Education & Welfare, Occupational Health Div., Washington, D.C.).

In many instances standards for employment of women have been voluntarily adopted by employers or by employer-employee cooperation through collective bargaining. These voluntary standards represent an earnest effort to provide satisfactory working conditions, but they vary from firm to firm leaving many people inadequately covered or completely uncovered. The Women's Bureau 1965 Handbook on Women Workers contains recommended standards for employment of women and summarized state labor laws for women. This handbook has been the source of information for the present discussion of the following topics: a) Hour standards; b) Health standards; c) Safety standards; d) Hours laws; e) Health laws; f) Occupational limitations. (HEIAS)

R 1

27,349

National Safety News. HOW DO SAFETYMEN VIEW THE WOMAN WORKER? Nat. Safety News, Nov. 1965, 92(5), 28-30.

National Safety News sent questionnaires to more than 11,000 safety directors throughout the country. The following questions were asked: a) Working in the same environment as men, is your female injury rate higher, lower, about the same; b) Do you find women workers more or less cooperative in safety than men, or about the same; c) what are the principal types of accidents that occur to women in your plant? Answers came from safety men in 403 plants, employing 115,330 women. Individual plants employed from a few women to several thousand. The following results were obtained: a) Women are felt to be safer workers than men; b) Women are considered to be about equally cooperative in safety as men; c) Those who understood question (c) above in terms of the part of the body injured single out hands and fingers, feet and toes. Those replying in terms of the kind of activity involving accidents mention falls primarily. The other activity they cited is lifting. (HEIAS)

27,350

National Safety News. EVOLUTION OF SAFETY LENSES. Nat. Safety News, Oct. 1965, 92(4), 27-28.

This article is concerned with the 150 year evolution of safety lenses. In the search for a safe, reliable lens, many different materials were tried and discarded. The advantages and disadvantages of each type of lens are briefly discussed. (HEIAS)

27,351

Hopkins, S.K. STANDARDS FOR SAFETY EYEWEAR. Nat. Safety News, Oct. 1965, 92(4), 29-30.

To be called "safety eyewear," spectacles, goggles, and face shields must conform to the specifications set forth in the American Standard Code for Head, Eye and Respiratory Protection, Z2.1-1959, or to specifications in certain federal standards. A committee of the American Standards Association has been appointed to revise eyewear portions of the Z2.1 standard, under new designation Eye Protection, Z-87. In all likelihood, the revision will contain stiffer requirements in some areas, particularly for lenses. This article discusses some of the ASA revisions. Federal specifications are also noted.

27,352

Shiras, F. EYE PROTECTION DEVICES. Nat. Safety News, Oct. 1965, 92(4), 31-39.

Hazards to industrial workers' eyes are many and complex. The range of protective eyewear available on the market today is equally complex. To select appropriate eyewear from amidst the jumble of nomenclature and variations on basic types is no easy task. The safety man choosing eye protection for his firm's employees must be aware of the kind and the intensity of eye hazards, the quality and characteristics of the various alternate choices of eyewear, and the fact that a certain amount of "protective eyewear" on the market does not deserve the name. Protection of worker's eyes is one the safetyman's most basic concerns. This article is an attempt to help him see through the confusion that has grown, like Topsy, in this realm of personal protective equipment. Our classifications of hazards and eyewear types are perhaps oversimplifications, but they will serve to guide the reader toward a basic understanding of eye injury prevention. Topics discussed include: a) Lens materials; b) Safety spectacles--types of frames; bridges, temples and side shields, plastic-lens spectacles; c) Goggles--eyecup goggles, fog-resistant eyecup goggles, rigid or semirigid mask-type goggles, flexible-fitting mask-type, Foundrymen's goggles, Gas-tight, Special use; d) Face Shields--"Visitors" eyewear and clip-ons; e) Problems of selection.

27,353

National Safety News. CHOOSING THE RIGHT EYE PROTECTION. Nat. Safety News, Oct. 1965, 92(4), 40-41.

This paper principally consists of an Eyewear/Hazard Chart. Directions for the use of the chart are as follows: where only a single hazard is encountered, particular color (solid green) squares indicate the optimum (in terms of protection and comfort) type of eyewear. Shaded green squares indicate eyewear permissible for the hazard specified, but not quite as good in terms of protection as the optimum type. Gray squares indicate that the eyewear is more than adequate for the hazard, incorporating features not necessary for the hazard specified. In many instances these features decrease comfort or result in increased cost. (HEIAS)

27,354

Smith, S.D. 1964 OVER-ALL ACCIDENT DEATH RATE UP 4 PER CENT. Nat. Safety News, Sept. 1965, 92(3), 27-29, 139-140. (Statistics Div., National Safety Council, Chicago, Ill.).

The 1964 accident death total was approximately 105,000, about 4% more than the 1963 death toll of 100,669. Disabling injuries numbered about 10,200,000, including 370,000 which resulted in some degree of permanent impairment--ranging from partial loss of use of a finger to blindness or complete crippling. Deaths from motor-vehicle accidents increased 9% and public deaths 6%. Work deaths remained unchanged, while home deaths decreased 2%. The following Tables are included in the report: a) The National Accident Fatality Toll; b) Deaths and Death Rates of Workers by Major Industries; c) Changes in Accidental Deaths, 1963-1964; d) 1964 Injury Rates, major industries.

R 1

27,355

Hering, R.P. SEVEN PRINCIPLES OF EMPLOYEE MOTIVATION. Nat. Safety News, Sept. 1965, 92(3), 30-31. (Western Electric's Oklahoma City Works, Oklahoma City, Okla.).

The revamped safety program at a Western Electric plant concentrates on small groups, line supervisors, and key personnel to stimulate a positive safety attitude in the individual employee. The psychological aspects of attitude formation were evaluated and incorporated in the program. Several psychological principles relating to attitude formation were correlated with the plant's activities to meet the program objectives. Among these were: a) Display a positive, constructive approach to your problem; b) Facts and projects must support each other to be penetrating and realistic; c) Use available tools to sell and promote your idea or concept; d) People vary in their receptiveness; Know your audience and show them a need; e) Attitude can be changed faster through primary groups having a personal interest in a condition, than through a broad secondary group where loyalties aren't deeply rooted; f) Good communications are essential to a positive safety attitude; g) Individual and small group participation and contributions will enhance the probability of program acceptance.

27,356

National Safety News. CONTACT LENS HAZARDS. Nat. Safety News, Aug. 1965, 92(2), p27. (J. Amer. Med. Assoc., April 1964, 188, p397).

The use of contact lenses by industrial workers sometimes compounds eye hazards already associated with certain jobs. Such use should alert industrial physicians to the need for emphasizing careful eye hygiene, repeated visual examination, and systematic recording of pertinent findings. The wearing of contact lenses is contraindicated in certain jobs that require critical emergency action or that expose the worker to unusual hazard of injury to the eyes. The job placement of each applicant who wears contact lenses must be determined only after thorough evaluation of job hazards and visual needs. Contact lenses are not in themselves protective devices and in fact may increase the degree of injury to the eyes. The same eye-protective devices used by other workers should be worn by contact lens wearers in similar employment.

27,357

Hirschorn, M. INDUSTRIAL NOISE. Nat. Safety News, June 1965, 91(6), 26-31. (Industrial Acoustics Company, Bronx, N.Y.).

Occupational loss of hearing is accepted as a compensable hazard under workmen's compensation laws throughout the United States. High noise levels may cause serious accidents because warning signals are not heard. Quality and quantity of work may be reduced because of inability to understand verbal instructions. Productivity may be affected because of fatigue, absenteeism, and low morale. A review of the regulatory, legal, and claims activity in the various states emphasizes why industrial noise control is essential. 3 basic steps are required in protecting hearing and in protecting industry against financially injurious claims: a) Audiometric pre-placement testing of all employees and periodic retesting; b) Noise measurement surveys to establish where excessive noise is present; c) Corrective measures controlling or protecting the individual by means of earplugs, earmuffs, or the creation of quiet areas. The following tables are included: Table I, Hearing Loss Compensation Benefits; Table II, Foundry Hearing Zone Noise Levels; Table III, Noise from Industrial Machines; Table IV, Weekly Average Exposure permitted. (HEIAS)

R 9

27,358

Taylor, H. & Mercer, J. (Eds.). GEMINI 8 MAY STILL GO IN FEBRUARY. Missiles & Rockets, Dec. 1965, 17(24), 12-14. (National Aeronautics & Space Administration, Cape Kennedy, Fla. & Manned Spacecraft Center, NASA, Houston, Tex.).

Several aspects of the Gemini 7 space flight are briefly discussed. The article is organized under the following headings: a) Launching; b) Station keeping; c) Radiation check; d) Intruder; e) Disappointments; f) Polaris tracked; g) Photometer studied; h) Plans modified. (HEIAS)

27,359

David, Heather M. GE PROPOSES STERILIZATION FACILITY. Missiles & Rockets, Dec. 1965, 17(24), 24-25.

A new concept in sterilization procedures that would allow last-minute fixes on planetary-bound spacecraft without disturbing their sterile condition will be demonstrated soon by General Electric's Missiles and Space Division. Instrumental in the concept is a GE facility called an assembly sterilizer, which would be operated at the launch complex at Cape Kennedy. The sterilization facility would not only be the site of terminal sterilization, but would allow repairs or fixes to be made after terminal sterilization without violating the spacecraft's integrity. An analog of a full-scale facility is being built in-house to demonstrate the concept. The following aspects of the sterilization facility are briefly discussed: a) Entry; b) Analog; c) Suit and tunnel; d) Design and manufacture; e) Preventive techniques; f) Personnel; g) Voyager; h) Improvement of bioassay.

27,360

Daniels, R.G. & Goldstein, B. LASERS AND MASERS--HEALTH HAZARDS AND THEIR CONTROL. Federation Proc., Jan.-Feb. 1965, 24(1), Part III, 5-27-5-30. (USA Office of the Surgeon General, Department of the Army, Washington, D.C.).

The object of this paper is to delineate many variables involved in tissue damage caused by exposure to laser and maser sources, and to present an acceptable interim control program. For this assessment it is appropriate to use the epidemiologic approach and method, namely, an evaluation of all the definable aspects of the interaction between the agent (laser beam), the host (man), and the environment involved (the laboratory and the field). Laser properties are identified, e.g., monochromaticity, collimation, power density, coherence; and 3 categories of laser devices are described: solid-state, gas, and injection. The host factors influencing the occurrence of body damage are next delineated; these are general as applying to all tissues and organ-specific (the eye). The specific agent factors are next considered, e.g., pulse duration, rate, frequency; atmosphere attenuation; optical modification; and some environmental considerations are introduced. Finally, tentative guidelines are set forth for handling lasers in laboratories.

R 14

27,361

Zaret, M.M. ANALYSIS OF FACTORS OF LASER RADIATION PRODUCING RETINAL DAMAGE. Federation Proc., Jan.-Feb. 1965, 24(1), Part III, S-62-S-64. (New York University Medical Center, New York, N.Y.).

Analysis of laser radiation factors resulting in the production of retinal damage show they are primarily based on thermal injury, which is influenced by the characteristics of the laser beam, the optical qualities of the eye and the extent of absorption in the retinal pigment epithelium and adjacent tissues. Secondly, many exotic types of biophysical phenomena must also be considered.

27,362

Sperling, H.G. FLASH BLINDNESS AS A FUNCTION OF WAVE-LENGTH SPECIFICITY. Federation Proc., Jan.-Feb. 1965, 24(1), Part III, S-73-S-77. (Honeywell, Incorporated, Minneapolis, Minn.).

Data are reported on the effects of adaptation to spectral bands of light on human foveal spectral sensitivity. These show that where very narrow adapting bands in the upper range of intensities of normal vision are used, extreme changes in the shape of the function result. This finding indicates that sensitivity might be preserved in parts of the spectrum, while permitting continuous viewing through special eye-protective filters. The results further indicate an approach to isolating the spectral response components of normal color vision and the magnitude of their response to light adaptation.

R 19

27,363

Straub, H. USE OF PROTECTIVE GOGGLES IN AREAS OF LASER RADIATION. Federation Proc., Jan.-Feb. 1965, 24(1), Part III, S-78-S-79. (Harry Diamond Laboratories, Washington, D.C.).

Energies generated by ruby, neodymium, and gallium arsenide laser pulses are sufficient to produce permanently blinding retinal burns in the human eye. It, therefore, imperative that personnel operating in areas of laser activity wear suitable protective goggles. Devices triggered into the "shut" state by the oncoming pulse must be considered unsafe, especially those developed against nuclear flashes. This also applies to most fixed devices, the spectrally selective filters, and mirrors. The only notable exception is the Jena color glass BG-18, effective against both the ruby and neodymium laser.

27,364

Schultz, Claire K. (Ed.). GUIDE TO CURRENT TERMINOLOGY IN BIOMEDICAL RESEARCH. Federation Proc., July-Aug. 1965, 24(4), Part I, 959-991. (Institute for Advancement of Medical Communication, Bethesda, Md.).

This compilation is based on data collected in a study of how the authors of papers given at annual meetings of the Federation of American Societies for Experimental Biology (FASEB) use the technical language of biomedical research; and insofar as these authors are representative of scientists in this country and elsewhere, the compilation reflects current usage within the biomedical research community. The chief reason for publishing the Guide is the hope that it will be a useful reference for biomedical scientists, particularly when they are choosing titles for their papers and when they are called upon to provide terms suitable for indexing their own work--a practice recently initiated by several biomedical journals, and one likely to become more general in the mounting effort to improve biomedical communication. It represents the core of a common language for the subject indexes of all FASEB publications. A magnetic-tape version of the Guide will make it possible for a computer to edit author terminology and to produce subject indexes rapidly and economically; at the same time, the computer will provide data on changes in usage that can be used for updating FASEB's indexing language and improving the computer program. Finally, this compilation may be of value to librarians, abstractors, indexers, and others concerned with handling biomedical information. It summarizes the findings of a 6-yr. study of biomedical research terminology.

R 4

27,365

Dobronravov, S.N. & Fischelev, Ya.R. CUTANEOUS VISION. Federation Proc., July-Aug. 1965, 24(4), Part II, T659-T661. (Cutaneous Vision Lab., Sverdlovsk Pedagogic Institute, Russia).

This article describes the findings from a series of psycho-physiological experiments in which the faculties of Rosa Kuleshova were examined. Thresholds of tactile, vibration, temperature, and light sensitivity of the skin of the fingers were determined and the effect of illumination, of the external environmental temperature, and of disturbances of the circulation in the fingers on her ability to count, to discriminate color, and to describe drawings were studied. Her increased tactile and temperature sensitivity led to several experiments, e.g., "blind" vs. inked text, black figures on white vs. black background under celluloid, "reading" printed text without touching letters (but close by) which disproved the tactile hypothesis. Likewise, the thermal hypothesis was disproved, e.g., colored strips pasted on metal plate, one edge of which was heated. Finally the evidence favoring the optic hypothesis is cited. (HEIAS)

R 3

27,366

Snyakin, P.G. RELATIONSHIP BETWEEN OPTIC AND CUTANEOUS PERCEPTION OF LIGHT IN MAN. Federation Proc., July-Aug. 1965, 24(4), Part II, T661-T664. (USSR Academy of Medical Sciences, Moscow, Russia).

The suggestion of the photochemical nature of the process of cutaneous reception is confirmed by the following facts: a) In darkness and with a low level of illumination, the ability of the skin of the fingers to distinguish between shades of light and color disappears. If this differentiation was based on thermal discrimination, as Richet suggests, in these conditions the S would not lose her ability to differentiate, for the difference in infrared emission from areas of different color evidently does not undergo a corresponding change during increasing darkness; b) There is the optimum of illumination, at which the photochemical changes of the carotenoids in the stratum corneum of the skin of the fingers take place at a certain level of contrast, where different groups of carotenoids possess different absorption curves. Contrast of colors and shades of light disappears during excessive illumination, which brings about a diminution of perception; c) Careful washing of the fingers with hot water and soap leads to considerable extraction of carotenoids from the stratum corneum of the skin and lowers the photosensitivity of the fingers. This question of cutaneous photosensitivity introduces other problems in neurophysiology, and, in particular, the problem of physiological compensation and competition between analysors. This phenomenon may be a manifestation of a unique physiological compensation of a slightly depressed function of the eyes, so that, in the course of visual analysis, the S involuntarily seeks the aid of the fingers for purposes of control and accuracy. The opposite possibility is not ruled out, namely, that the role of the eyes is somewhat diminished because of maximal utilization of the fingers, in which case this phenomenon must be regarded as the result of physiological competition in perception.

R 6

27,367

Grindel', O.M., Boldyreva, G.N., Burashnikov, E.N. & Andreevskii, V.M. POSSIBLE APPLICATION OF CORRELATION ANALYSIS TO HUMAN ELECTROENCEPHALOGRAM. Federation Proc., Sept.-Oct. 1965, 24(5), Part II, T753-T757. (USSR Academy of Medical Sciences, Moscow, Russia).

This investigation determined whether the method of correlation may be used to analyze the EEG of a healthy person at rest, during photic stimulation, and during changes in his functional state, as well as the EEG of patients with circumscribed brain lesions. The auto- and cross-correlations were carried out by means of an automatic correlograph; functions were obtained for the complete EEG, and the components delta, theta, alpha, and beta. During photic stimulation, periodic activity of the occipital and parietal regions corresponded to the rhythm of the stimulation, as seen in the auto-correlograms; this was in contrast to the quasi-periodic process characteristic of "spontaneous" EEG rhythms (attenuating waves, diminishing in amplitude). Cross-correlation functions showed that the degree and character of the connection between areas of the cortex varied during this stimulation. Some of the findings based on the correlation functions include: no common periodic process in the EEG of the temporal and occipital regions; periodic activity common to occipital and central and frontal processes; periodic process absent from occipital and frontal EEGs of healthy, drowsy person; during pathological sleep different parts of the brain are united by common periodic activity. (HEIAS)

R 14

27,368

Popov, V.A. CHANGES IN PHYSIOLOGY OF NORMAL INDIVIDUALS IN THE ARCTIC. Federation Proc., Nov.-Dec. 1965, 24(6), Part II, T945-T947. (Leningrad, Russia).

Severe stress, hypovitaminosis, and light deprivation produce changes in the physiology of the human organism in the Arctic. Of the aspects of hepatic function studied, the ability of the liver to regulate serum protein colloidal reactivity is depressed first and most markedly; blood pigment clearance is also impaired. The most important changes in peripheral blood composition consist of tendencies toward leukopenia, eosinopenia, monocytopenia, and low ESR's; these changes could be related to inhibition of the function of the reticuloendothelial system. Healthy individuals usually exhibit a tendency toward hypotension; this was observed 4.5 times more often than hypertension. Tests of cardiovascular function revealed great lability of the pulse rate and arterial pressure and delayed restoration of these measurements to the original levels after the completion of exercise.

R 5

27,369

Baevskii, R.M. & Volkov, Yu.N. CLINICOPHYSIOLOGICAL EVALUATION OF SEISMOCARDIOGRAPHIC DATA OBTAINED DURING SPACE FLIGHTS OF VOSTOK V AND VOSTOK VI. Federation Proc., Nov.-Dec. 1965, 24(6), Part II, T953-T956.

The object of the present investigation was to make a clinicophysiological evaluation of the seismographic data obtained during the space flights of the ships Vostok V and Vostok VI. For this purpose, telemetric recordings of the seismocardiograms were compared with the seismocardiograms recorded from 38 healthy persons and 74 patients. By comparing the seismocardiographic changes observed in the cosmonauts with the various abnormalities found in the seismocardiograms of the patients, a number of analogies could be deduced and a hypothesis could be suggested to explain the mechanism of the circulatory disturbance during the prolonged action of weightlessness. Clinical analysis of the results of seismocardiographic investigations under conditions of orbital flight shows that both the sympathetic and the parasympathetic divisions of the autonomic nervous system take part in the adaptive reactions. At the beginning the leading role is played by the sympathetic reactions, for the changes in the "extracardial" indices are mainly associated with an increase in the tone of the sympathetic system. Here, as also in the reactions to physical effort, a process of centralized regulation is brought into operation, mediated through the sympathetic nerve endings. The inclusion of the "intracardial" factors evidently implies the inclusion of the parasympathetic system in the adaptation process. At first both systems act simultaneously, but later, as a result of the prolonged exposure to the conditions of flight and also, perhaps, to the lightening of the work load placed on the circulatory apparatus, the parasympathetic influences become stronger and are ultimately dominant. Hence, the phase of relatively stable adaptation has 2 periods: a) a period of simultaneous action of "extracardial" and "intracardial" mechanisms of compensation; and b) a period of action of mainly "intracardial" mechanisms.

R 7

27,370

Bongard, M.M. & Smirnov, M.S. THE "CUTANEOUS VISION" OF R. KULESHOVA. *Federation Proc.*, Nov.-Dec. 1965, 24(6), Part II, T1015-T1018. (USSR Academy of Sciences, Moscow, Russia).

This article describes 2 series of experiments performed on R. Kuleshova to demonstrate her faculties. In the first, the boundaries of her "visible" spectrum were found to be the same as for an ordinary eye with the same room illumination and she was found to be completely insensitive to infrared radiation; about a dozen color equalities were established in which the emissions equal for her fingers were also similar to the eye; the phenomenon of successive color contrast was demonstrated; flicker was "perceived" at frequencies < 30-50 cps; no "clairvoyant" faculties were observed. In the second, her ability to distinguish the color and shape of a picture was demonstrated under conditions where peeking was completely excluded. (HEIAS)

R 33

27,371

Sergienko, N.M. RELATIONSHIP BETWEEN DEGREE OF MYOPIA AND VISUAL ACUITY. *Federation Proc.*, Nov.-Dec. 1965, 24(6), Part II, T1019-T1022. (Eye Diseases Dept., Donetsk Medical Institute, Russia).

The cause of the discrepancy between the degree of myopia and the visual acuity without correction is an optico-physical factor, the nature of which is not yet known. This factor acts by reducing the size of the light-diffusion figures. The more marked the reduction in size of the light-diffusion figures, the higher the visual acuity without correction.

R 23

27,372

Puchinskaya, L.M. CORRELATION BETWEEN SPECIFIC AND NONSPECIFIC RESPONSES TO LIGHT IN THE HUMAN ELECTROENCEPHALOGRAPH. *Federation Proc.*, Nov.-Dec. 1965, 24(6), Part II, T1023-T1027. (USSR Academy of Medical Sciences, Institute of Neurosurgery, Moscow, Russia).

Evoked potentials of 2 types, differing in both latent period and area of development, are recorded in the EEG to a single flash. A response which may be regarded as the specific response to light, as it develops in relation to the visual projection area, is recorded in the posterior parts of the hemispheres (occipital and parietal leads). The response to light in the central region (parietal, central and posterior frontal leads) is nonspecific, as responses to light, sound and electrical stimulation are all recorded in the area. The predominant element of the specific response is a positive-negative wave. The first, positive phase may be preceded by a small negative potential, and a second, negative wave may follow the main diphasic element. The main feature of this response is a large positive potential of considerable length, followed by a small negative wave. The main positive wave is generally preceded by a very small, short, negative wave. The nonspecific response to light is generally a positive potential, sometimes preceded by a very small negative wave. The positive wave is sometimes also followed by a negative potential. The change in the specific response on repeated stimulation consists in a gradual increase in its amplitude as it spreads to the neighboring parietal and central regions. Nonspecific responses to light also show certain quite definite changes on repeated stimulation. As already stated, the first few stimuli produce a diffuse response, with amplitude greatest in the central and posterior frontal regions. With subsequent stimuli there is a gradual shift of the nonspecific response towards the primary projection area, and its amplitude in the central areas may decline.

R 19

27,373

Howard, A. & Scott, R.A. A PROPOSED FRAMEWORK FOR THE ANALYSIS OF STRESS IN THE HUMAN ORGANISM. *Behav. Sci.*, April 1965, 10(2), 141-160. (University of Hawaii, Honolulu, Hawaii & Russell Sage Foundation, New York, N.Y.).

Stress, the bugaboo of modern life, comes from many different sources and affects us all in one way or another. Viewing human functioning as a problem-solving phenomenon, stress is here explained in terms of tension that results from the organism's inability to master presenting problems and its consequent need to devote excess energy and resources to maintenance activities. This encompassing theoretical scheme proposes to reduce the conceptual barriers between various biochemical, physical, psychological, and sociocultural models of stress.

R 81

27,374

Miller, J.G. LIVING SYSTEMS: BASIC CONCEPTS. *Behav. Sci.*, July 1965, 10(3), 193-237. (Mental Health Research Institute, University of Michigan, Ann Arbor, Mich.).

This analysis of living systems uses concepts of thermodynamics, information theory, cybernetics, and systems engineering, as well as the classical concepts appropriate to each level. The purpose is to produce a description of living structure and process in terms of input and output, flows through systems, steady states, and feedbacks, which will clarify and unify the facts of life.

R 118

27,375

Bower, J.L. GROUP DECISION MAKING: A REPORT OF AN EXPERIMENTAL STUDY. *Behav. Sci.*, July 1965, 10(3), 277-289. (Harvard University, Cambridge, Mass.).

Reported here is an experiment on group decision making that takes into account such variables as the decision rule used by the group, the information structure of the group, and the relationship among individual goals and the group goal. The findings have permitted some tentative conclusions. It appears useful to analyze group problem solving in terms of a multistage model. The model, in turn, suggests ways in which elements of the group problem can be separated and subjected to independent study. The 3 stages--search, analysis, choice--interact with information, motivation, and the choice mechanism. We have suggested 1 possible set of relationships that could explain the data. We believe future research conducted in order to explore and confirm these relationships, or provide new ones, will be fruitful.

R 10

27,376

Miller, J.G. LIVING SYSTEMS: STRUCTURE AND PROCESS. *Behav. Sci.*, Oct. 1965, 10(4), 337-379. (Mental Health Research Institute, University of Michigan, Ann Arbor, Mich.).

An article (HEIAS 27,374) in the previous issue of this journal outlined the basic principles of the author's general systems behavior theory as it will be set forth in his *Living Systems*, to be published in a few months. This article and the following one continue the exposition of this viewpoint. Salient characteristics of the subsystem and system-wide structures and processes which generally occur at all levels of living systems are considered here. The scientific literature of the mathematical, biological, and social behavioral sciences that investigate each of these levels can be integrated and interpreted in terms of these concepts. The empirical findings of that literature will be submitted to detailed analysis in the forthcoming book in terms of the schema outlined here. The approach used is designed to emphasize the unity of the phenomena of life, from cells to supranational systems.

R 44

27,377

Miller, J.G. LIVING SYSTEMS: CROSS-LEVEL HYPOTHESES. *Behav. Sci.*, Oct. 1965, 10(4), 380-411. (Mental Health Research Institute, University of Michigan, Ann Arbor, Mich.).

The previous article (HEIAS 27,376) considered salient characteristics of the subsystem and system-wide processes which generally occur at all levels of living systems. Using the concepts developed there, the present exposition states 165 hypotheses that may be applicable to 2 or more levels of living systems. Some are original with the author. Some have previously been proposed by other writers, usually as applying to systems at 1 level only, and often to only 1 type of system. These cross-level hypotheses, if supported by empirical evidence, can be very powerful in generating general theory of living systems, so long as differences among the various levels, types, and individual cases are taken into account. The numbered divisions of this paper deal with the same topics as do similarly numbered sections in the preceding article. Certain sections are omitted here because no material relevant to their topics was found.

R 125

27,378

Todd, F.J. & Hammond, K.R. DIFFERENTIAL FEEDBACK IN TWO MULTIPLE-CUE PROBABILITY LEARNING TASKS. *Behav. Sci.*, Oct. 1965, 10(4), 429-435. (University of Colorado, Boulder, Colo.).

This study compared the effects of traditional outcome feedback with feedback which directly enables Ss to examine the validities of cues so that they might be utilized accordingly. Also considered here were the variables: differential cue validities, set, and sex. 72 undergraduates: 36 male, 36 female--served as Ss. 2 experimental tasks: A and B representing different cue-distal variable relationships were constructed; 3 cues: size of circle, position of chord in circle, position of pointer on periphery of circle--were given equal (A) or unequal validities (B); 3 feedback conditions: outcome, lens model, mixed--were tested in each task group; 2 sets: analytic and intuitive--were induced via instructions in half of each feedback subgroup; and the male and female Ss were distributed equally throughout. The lens model and mixed feedback groups showed performances superior to the outcome group; the set and sex subgroups showed no differences in achievement. The primary finding of the study was that "in multiple-cue probability tasks, information which allows the S to compare his dependency on cues with their ecological validities is of greater value than knowledge of how well his responses correspond trial by trial to the criterion values. Furthermore the addition of the latter to the former provides no greater success than does lens model feedback alone." (HEIAS)

R 15

27,379

Parks, J.R. PREDICTION AND ENTROPY OF HALF-TONE PICTURES. *Behav. Sci.*, Oct. 1965, 10(4), 436-445. (Monsanto Company, St. Louis, Mo.).

This article describes research on methods for computing redundancy of pictures and machine techniques for the measurement of information content of graphics. The 3 pictures here: Sailor, Girl, Abstract, are each representative of a class of pictures which are characterized by a value of redundancy. This is so, since the shade values in each picture can be redistributed in many ways with the statistical structure of the arrangement of the shade values relative to each other kept constant. A machine, such as that discussed by Cherry and Gouriet (1953; Bouriet, 1952), if used in the measurement of redundancy, would classify all such rearrangements correctly, whereas human beings would not. It is seen that a very unusual arrangement of the shade values of the Sailor would be dubbed an Abstract even though the redundancy is the same high value. As a consequence the term Abstract covers a much wider range of redundancy than Girl or Sailor. Any arrangement with which a particular person or group of people have had little experience will in general be classified by them as nonsense, longhair, or abstract. This work shows that unlike music and literature, which are relatively fixed at quite high redundancies with narrow permissible ranges of variation, the universe of pictures has a range of redundancy from zero for a truly random picture to unity for a picture composed of a uniform shade. It is clear that meaning has not been involved in this work as it was not involved in Shannon's work on language. However, if meaning is subsumed under subjectivity, then the work reported here suggests a possibility of investigating it in relation to pictures.

R 14



27,380

Sawyer, J. & Friedell, M.F. THE INTERACTION SCREEN: AN OPERATIONAL MODEL FOR EXPERIMENTATION ON INTERPERSONAL BEHAVIOR. Behav. Sci., Oct. 1965, 10(4), 446-460. (University of Chicago, Chicago, Ill. & University of Michigan, Ann Arbor, Mich.).

The basic model underlying the Interaction Screen may be summarized as follows: motivated by reward, 1 S interacts with another, in a manner determined jointly by his personality, by the situational conditions, and by the interaction of the other person. The components and relations of this model are represented in Figure 3. The 4 major components of reward, interaction, personality, and conditions may be considered as representing what the S gets from the situation, what he does in it, what he brings to it, and how the situation itself is structured. Reward is the assumed motivation of the Ss for their interaction. The reward of each person is determined strictly by his actions and by those of the other; the precise manner in which these actions combine to determine reward is completely specified by the reward grid. Interaction--behavior that provides a stimulus to the other person--comprises action, communication, affect, and timing (as listed in Table 1), all of which interact to influence one another, and which, through action, influence the reward of both persons. Identification of the determinants of interaction is one of the major goals of the Interaction Screen. There are 3 classes of determinants, defined so as to be exhaustive: personality, situational conditions, and the other's interaction. The other's interaction includes all of his behavior that provides a stimulus for the first person. Situational conditions include all other stimuli provided the person--both fixed and variable. Personality includes all characteristics that influence the person's response but are not external stimuli in his immediate situation.

R 37

27,381

Dunphy, D.C., Stone, P.J. & Smith, M.S. THE GENERAL INQUIRER: FURTHER DEVELOPMENTS IN A COMPUTER SYSTEM FOR CONTENT ANALYSIS OF VERBAL DATA IN THE SOCIAL SCIENCES. Behav. Sci., Oct. 1965, 10(4), 468-480. (Harvard University, Cambridge, Mass.).

This article describes the system as it is currently in operation, emphasizing developments since 1962. The system consists basically of 3 elements: a social science dictionary, the verbal data to be analyzed and programs. There are 3 stages of programs which operate to perform the content analysis, tabulate the results, and provide further investigation of the findings: lagging procedure, listing and tabulating, and retrieval procedures. The dictionaries, data, and programs are discussed in some detail.

R 18

27,382

Weldon, R.J. A GENERAL PURPOSE PROGRAM FOR THE ANALYSIS OF VARIANCE. Behav. Sci., Oct. 1965, 10(4), 481-484. (University of Arizona, Tucson, Ariz.).

3 qualities were sought in the development of the ANOVA program described here. First, the program should be able to handle a variety of problems so that a train of different problems could be handled by 1 deck in a single pass through the computer. Second, the program should be powerful in the sense that it would be able to compute the large number of interaction sources that develop as factors increase, without itself (the program) becoming unduly large. Third, the task of the user of the program should be made as simple as possible. The actual characteristics of the program are discussed relative to these 3 purposes.

R 6

27,383

Wood, C.D., Kennedy, R.S. & Graybiel, A. REVIEW OF ANTIMOTION SICKNESS DRUGS FROM 1954-1964. Aerospace Med., Jan. 1965, 36(1), 1-4. (USN School of Aviation Medicine, Pensacola, Fla.).

In reviewing the literature from the last 10 yrs on the antimotion sickness drugs Hyoscine (Scopolamine) still appears to be one of our most effective antimotion sickness drugs. Its severe side effects of drowsiness, vertigo, and dry mouth limit its usefulness. Meclizine (Bonamine) and Cyclizine (Marezine) are reported to be the most effective of the antihistamines. Their side effects are milder than most other preparations and their level of reported effectiveness approaches that of hyoscine. Many of the newer preparations are less effective than the above-mentioned drugs and others have yet to fully prove themselves.

R 50

27,384

Rumbaugh, D.M. & Ternes, J.W. LEARNING-SET PERFORMANCE OF SQUIRREL MONKEYS AFTER RAPID DECOMPRESSION TO VACUUM. Aerospace Med., Jan. 1965, 36(1), 8-12. (San Diego State College, San Diego, Calif.).

Squirrel monkeys, *Saimiri sciureus*, were decompressed to near vacuum (less than 2 mm. Hg abs.) for varying time intervals (to 90 sec) and then tested for their proficiency in a learning-set task. All animals had been trained in learning set prior to decompression and were tested twice postdecompression, first at one week and again at 2 months. Of 20 animals decompressed, there were 2 fatalities--1 in the 11 sec decompression group and the other in the 90 sec group. Among survivors no loss in learning set proficiency was detected. Animals in the more severely decompressed groups required more time to recover to apparent normality. They were less inclined to eat and drink postdecompression, and, also, lost significantly more weight than the other groups. Short-term interference with vision and hearing was noted. It was concluded that if life be spared, subsequent restoration of function to predecompression baselines is highly probable.

R 7

27,385

Miller, P.B. & Leverett, S.D. TOLERANCE TO TRANSVERSE (+Gx) AND HEADWARD (+Gz) ACCELERATION AFTER PROLONGED BED REST. *Aerospace Med.*, Jan. 1965, 36(1), 13-15. (USAF School of Aerospace Medicine, Internal Medicine Dept., Brooks AFB, Tex.).

Tolerance to the transverse (+Gx) acceleration of a simulated Gemini re-entry profile was determined before and after 4 weeks of absolute bed rest. Tolerance to headward (+Gz) acceleration was studied before and after 4 weeks of absolute bed rest and 2 weeks of modified bed rest. As judged by the degree of physical discomfort, the ability to respond to a central light, or the presence of electrocardiographic abnormalities, tolerance to +Gx was unaffected by 4 weeks of absolute bed rest. In each S studied, heart rates during peak acceleration were higher after bed rest than before. As judged by the level of acceleration at which central vision was lost, no significant change in tolerance to headward (+Gz) acceleration of rapid onset was observed after 2 weeks of modified bed rest or after 4 weeks of absolute bed rest. After each type of bed rest, the majority of the Ss had decreased tolerance to headward (+Gz) acceleration of gradual onset, but the M decrease was not statistically significant. M heart rates at equivalent levels of +Gz were significantly higher after both periods of bed rests. The only arrhythmia of clinical importance noted was the appearance of bursts of premature atrial contractions during G.O.R + Gz in 1 S after 2 weeks of bed rest.

R 9

27,386

Botan, E.A., Phaneuf, J. & Lambert, J. STUDY OF AN INSTRUMENTED ANALYTICAL SYSTEM FOR EXTRA-TERRESTRIAL STUDY OF ATMOSPHERES, POSSIBLE LIFE FORMS AND SOILS. *Aerospace Med.*, Jan. 1965, 36(1), 21-25. (Avco Research Center, Wilmington, Mass.).

A compact, lightweight analytical instrument package is proposed which can be landed on an extraterrestrial body. This system will sample and then analyze the environment by means of ultraviolet, visible, and infrared microspectrometry, microscopy and emission spectrometry. The data thus obtained will be converted to telemetry signals for transmission to earth. The advantage of absorption spectroscopy, emission spectroscopy, and microscopy are manifold. For example, the samples examined can be visually presented through television techniques. This would yield information concerning size, shape, and possible cellular or morphological characteristics. Also information concerning the chemical composition of the visualized particles can be obtained. The presence of hydroxyls, methyls, amidos, carbonyls, and double bonds are just a few of the structural features that can be determined by absorption spectrometry. Proteins and nucleic acids are structures which can also be determined by these methods. Emission spectroscopy will determine the presence of virtually all the elements in the periodic table of the samples examined. Thus a comprehensive analysis (inorganic, organic, and biological) can be made of the particles visualized.

R 17

27,387

McNeil, J.S. & Giffen, M.B. MILITARY RETIREMENT: SOME BASIC OBSERVATIONS AND CONCEPTS. *Aerospace Med.*, Jan. 1965, 36(1), 25-29. (USAF Hospital, Lackland AFB, Tex.).

Prior to World War II military retirement posed little or no problem since relatively few were on retired rolls. However, with the increase in military strength and the number of retirements, many problems have arisen which were not previously noted by either the personnel people or medical personnel. Some of the problems and confusion which arise when individuals are faced with retirement are presented in this article. Early assistance by many different specialties can be of invaluable aid to the prospective retiree. Support and assistance in developing a realistic preretirement program will help channel the individual's anxiety and energy in a constructive direction. Success at this stage can help the individual retire to another career or interest and not simply see himself as "put to pasture." During the period of role confusion, the retiree needs help in redefining his identity and re-establishing a role for himself. Most retirees successfully negotiate the role confusion phase without professional intervention, but expert help at this time would serve to reduce the amount of emotional trauma and turmoil. Therapy oriented toward social functioning will prove beneficial to most. Assistance in this critical phase of a career is in the field of mental health. Once the individual has become maladjusted to and with his retirement, more prolonged and intensive treatment is required.

R 6

27,388

Poulton, E.C. & Kerslake, D.McK. THE INITIAL STIMULATING EFFECT OF WARMTH UPON PERCEPTUAL EFFICIENCY. *Aerospace Med.*, Jan. 1965, 36(1), 29-32. (Applied Psychology Research Unit, MRC, Cambridge, England & RAF Institute of Aviation Medicine, Farnborough, Hants, England).

12 men listened to letters for 20 min. and simultaneously monitored 5 dials arranged in a semicircle, once at 45°C (113°F) and once at 25°C (77°F) in a counterbalanced order. Absolute humidity was maintained at 10 mm. Hg. and air movement at 500 ft per min giving effective temperatures of 30°C (86°F) and 19°C (65°F) respectively. On the first day efficiency was maintained reliably better in the warm than in the cool on both tasks ( $p = .025$ ). On the second day efficiency depended partly upon the temperature, and partly upon the level of efficiency of the previous day. Conclusion: On first entering a warm environment may have a stimulating effect upon perceptual efficiency.

R 15

27,389

Solomons, C.C., Shuster, D. & Kwan, A. BIOCHEMICAL EFFECTS OF MECHANICAL STRESS. I. CONTROL OF P<sup>32</sup> RELEASE FROM RAT FEMUR IN VITRO. *Aerospace Med.*, Jan. 1965, 36(1), 33-34. (Biochemistry Dept., McGill University, Montreal, Quebec, Canada).

The effect of mechanical force on the release of P<sup>32</sup> by male rat femurs was studied. The rats were injected intraperitoneally with Na<sub>2</sub>HP<sup>32</sup>O<sub>4</sub> (1 µc per g body weight) and sacrificed at 9, 17, 21, 43 and 65 hrs later. The bones were treated in vitro with Krebs-Ringer solution for 1 hr and the release of P<sup>32</sup> measured. It was found that intermittent tension (250 g applied 300 times per min) reduced the release of P<sup>32</sup> from the femurs of animals injected up to 18 hrs before sacrifice. The rate of P<sup>32</sup> release from animals injected 18-65 hrs before sacrifice was increased by mechanical stress. It is suggested that the actions of vitamins, hormones and mechanical stress on the remodelling ability of the skeleton may be fundamentally related.

R 8

27,390

Wallman, H., Steele, J.A. & Lubitz, J.A. MULTI-FILTER SYSTEM FOR WATER RECLAMATION. Aerospace Med., Jan. 1965, 36(1), 35-39. (Electric Boat Div., General Dynamics Corporation, Groton, Conn.).

A study was made of the expected composition of dehumidification water and wash water in a space station. Multi-filter subsystems containing activated carbon, ion exchange resin and a particulate filter were designed and tested. The dehumidification water subsystem produced potable water from air-conditioning condensate obtained from a space simulator. The wash water subsystem treated used wash water and produced water suitable for reuse as wash water. Chemical, bacterial, and organoleptic results are given. The multi-filter system uses no electric power, has no moving parts, is highly reliable, and is ideally suited for operation under weightless conditions. It is not suitable for use with urine because of the relatively high solute concentration of urine.

R 6

27,391

Burton, R.R. & Smith, A.H. CHRONIC ACCELERATION SICKNESS. Aerospace Med., Jan. 1965, 36(1), 39-44. (Animal Physiology Dept., University of California, Davis, Calif.).

The long-term exposure of chickens to centrifugal forces may lead to a highly lethal "chronic acceleration sickness." Clinically this disease has 2 syndromes, which are described. This sickness is characterized by a ready reversibility upon return to normal gravity, indicating that permanent organic debility is not involved. This contention is supported by absence of specific lesions at autopsy. Summaries of post-mortem pathological findings are presented.

R 14

27,392

Pierson, W.R. & Rich, G.Q. OXYGEN COST OF WORK WHEN THE BODY WEIGHT IS NOT LIFTED AGAINST GRAVITY. Aerospace Med., Jan. 1965, 36(1), 44-46. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif. & San Fernando Valley State College, Northridge, Calif.).

An exercise program wherein the body was not lifted against gravity was administered to 24 male college students.  $O_2$  consumption rates were measured during rest, exercise, and recovery to resting levels. At no time did the  $O_2$  consumption exceed that associated with "light" work, but for the 9 min. of exercise, over 5 min. were required for the return to resting level. There was no relationship between  $O_2$  consumption and total body weight or surface area.

R 19

27,393

Luehrs, R.E. RADIATION HAZARD FROM CONTAMINATED AIRCRAFT. Aerospace Med., Jan. 1965, 36(1), 54-55. (USS Enterprise CVA(N)-65).

Repeated surveys for the presence of radioactive contamination of aircraft, flight personnel and maintenance personnel aboard USS Enterprise CVA(N)-65 from 7 Feb. 1963 through 2 Aug. 1963 showed appreciable amounts of beta and gamma radiation due to fallout from nuclear weapons detonations. No man aboard, however, attained the maximum permissible exposure as a result.

R 2

27,394

Lamb, L.E. HYPOXIA--AN ANTI-DECONDITIONING FACTOR FOR MANNED SPACE FLIGHT. Aerospace Med., Feb. 1965, 36(2, Sec. 1), 97-100. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Physiological deconditioning results in a clinical picture of decreased biological activity, manifested by decreased plasma volume, decreased red blood cell mass, decreased red blood cell production with inactive bone marrows, increased resting heart rate, decreased exercise tolerance, decreased orthostatic tolerance, decreased coronary blood flow, increased storage of catecholamine products in the myocardium, decreased muscle mass and muscle tone with resultant increased nitrogen excretion and increased calcium mobilization with increased calcium excretion. Acclimatization produces clinical features which are exactly opposite of those noted in deconditioning. Acclimatization results in increased organ activity with increased bone marrow mass and increased blood volume. With acclimatization there is a tendency toward vagotonia with decreased heart rate. There is an increased exercise tolerance and an increased coronary blood flow. These observations suggest that prolonged hypoxia of a sufficient degree to produce suitable acclimatization is a useful agent in preventing deconditioning during manned space flight and in those situations on earth that result in deconditioning.

R 16

27,395

Soliday, S.M. & Schohan, B. PERFORMANCE AND PHYSIOLOGICAL RESPONSES OF PILOTS IN SIMULATED LOW-ALTITUDE HIGH-SPEED FLIGHT. Aerospace Med., Feb. 1965, 36(2, Sec. 1), 100-104. (Human Factors Group, North American Aviation, Inc., Columbus, Ohio).

8 experienced jet test pilots performed piloting and navigational tasks while "flying" a TFX-type aircraft in simulated low altitude, high speed missions. The flights were made in a moving-base simulator that had a total vertical travel of 12 ft and an acceleration capability of + 6 G. The pilots maintained a 500-foot clearance equally well at airspeeds of .9 and 1.2 Mach and over flat and hilly desert terrain. However, their ability to maintain this clearance deteriorated greatly when the degree of buffeting increased. Navigational task performance did not vary with experimental condition. Heart and respiratory rates were within a normal range for the tasks being performed, although positive correlations of both rates with vertical accelerations and with deviations of the "aircraft" about the required clearance altitude were found. A side-stick controller was found to be much more efficient than a conventional center stick under the experimental conditions used.

R 9

27,396

Stewart, J.D. & Clark, B. CORIOLIS EFFECTS DURING PITCH AND ROLL MANEUVERS IN A PILOTTED FLIGHT SIMULATOR. *Aerospace Med.*, Feb. 1965, 36(2, Sec. 1), 105-112. (Ames Research Center, NASA, Moffett Field, Calif. & Psychology Dept., San Jose State College, San Jose, Calif.).

The purpose of this study was to determine the effects of suprathreshold values of Coriolis acceleration on the pilot of a flight simulator with particular reference to his perception of illusory motion and his position in space. The particular Coriolis stimuli selected were those that would be anticipated in the use of the Ames 5-degree-of-freedom simulator in studies of aircraft and spacecraft. 3 modes of simulator motion were used: rotation of the cockpit around the z axis at 30 ft from the center of rotation, and pitch and roll of the cockpit. The data consisted of subjective reports of apparent motion and estimates of body position. 7 experienced observers who showed normal post-acceleration and post-deceleration after effects of rotation on the simulator were used. 2 were research pilots, and the others were the authors and 3 members of the Ames staff. The frequency of reports of Coriolis effects increased as a function of simulator velocity from 2 to 12 rpm for both pitch and roll maneuvers. The frequency of the Coriolis effects was nearly 100% at 7 rpm and above. The duration of the Coriolis effects also increased as a function of the simulator velocity, the duration of the effects for pitch and roll being very similar. The M duration of the reported rotation was approximately 9 sec at 2 rpm and 15 sec at 12 rpm, for the pitch and roll maneuvers used. The observers' estimate of body position tended to be very close to the deviation of his body position from the direction of the resultant force acting on him under the various experimental conditions. The observers did, however, tend to underestimate the variation of their body position at the lower velocities in accordance with similar static estimates, but they tended to be close to the corresponding angle at 12 rpm.

R 7

27,397

Frey, A.H. EXPERIMENTAL CONTROLS AND BIOLOGICAL EXPERIMENTS WITH ATMOSPHERIC IONS. *Aerospace Med.*, Feb. 1965, 36(2, Sec. 1), 121-123. (Research Institute, State College, Penn.).

Our data on instrumentation and on the controls which are necessary when studying the biological effects of atmospheric ions are summarized in this paper. Sources of unreliability in experiments, such as measurement devices, lack of grounding, movement of S or specimen, etc., are identified. On the basis of these data, it is concluded that there is no experimental basis for the advocates of the polar positions that ions do or do not have a significant effect.

R 8

27,398

Black-Schaffer, B., Prusiner, S.B. & Esparza, H. TOLERANCE OF THE VESTIBULAR APPARATUS OF THE HYPOTHERMIC HAMSTER TO 840 G ACCELERATION. *Aerospace Med.*, Feb. 1965, 36(2, Sec. 1), 123-126. (Pathology Dept., University of Cincinnati College of Medicine, Cincinnati, Ohio).

Female golden hamsters were spun at 840 G in a refrigerated centrifuge during profound hypothermia while immersed in an aqueous-glycerine solution at 5° C. The animals were divided into 6 groups, depending on their attitude in respect to the center of spin. When the force of spin is unevenly distributed between the 2 vestibular organs of a given hamster the animal assumes the position and stance characteristic of a hemilabyrinthectomy on the side subjected to the greater force. When the force is evenly distributed in respect to the vestibular organs comparatively minimal abnormalities of balance or posture ensue. The disturbances which are elicited by centrifugation disappear by 2 to 3 weeks. They may be reproduced, repeatedly, by further spinning after complete recovery of the animal. Altering the attitude of a hamster from one to another of the 6 positions will elicit the disturbance characteristic of the new attitude, regardless of the preceding attitude and syndrome. Recovery is again complete within a period of 2 to 3 weeks. It is proposed that the normal protection afforded the vestibular apparatus by the endo and perilymph may be amplified by hypothermia through enhanced viscosity of the gelatinous membranes bearing the otoconia, thus further minimizing migration of the otoliths in the centrifugal field.

R 26

27,399

Wick, R.L., Jr. CIVIL AVIATION AND CONTACT LENSES. *Aerospace Med.*, Feb. 1965, 36(2, Sec. 1), 127-130. (Garrett Corporation, Los Angeles, Calif.).

One of the problems currently increasing in magnitude in civil aviation involves the pilot who wishes to wear contact lenses. Although there are a number of theoretical hazards, as a practical matter, there appear to be no contraindications. A majority of ophthalmologist Aviation Medical Examiners, who are also pilots, approve their use if properly fitted and supervised by the ophthalmologist experienced with contact lenses. Over half of the group who also are certified by the ophthalmological board even approve their use for airline pilots.

R 11

27,400

Langham, W.H., Brooks, P.M. & Grahn, D. (Eds.). RADIATION BIOLOGY AND SPACE ENVIRONMENTAL PARAMETERS IN MANNED SPACECRAFT DESIGN AND OPERATIONS, A SPECIAL REPORT. *Aerospace Med.*, Feb. 1965, 36(2, Sec. 1), 1-55. McDonnell Aircraft Corporation, St. Louis, Mo. & Los Alamos Scientific Lab., University of California, Los Alamos, N.M.

This report is aimed at deriving, "insofar as possible, criteria for consideration of man's response to space radiation exposure so that radiation risks may be taken into account, during spacecraft design and operational planning phases, along with the other inherent hazards of manned space flight." The space radiation environment is first discussed: general aspects, geometrically trapped radiation, solar particle events, galactic and secondary radiations. The biological effects of ionizing radiation is then considered in terms of: early somatic effects, e.g., initial prodromal reaction, hematopoietic depression, fertility and sterility; delayed somatic effects, e.g., increased incidence of leukemia, cataracts; genetic effects; factors modifying radiation effects, e.g., depth-dose distribution and partial-body exposure, dose fractionation and protraction, spacecraft design and operational factors. Space radiation protection guides specify radiation response criteria for hazards evaluation to be used in developing maximum acceptable risk values based on each mission. Finally, the requirements for on-board dosimetry in manned space flight missions are considered. (HEIAS)

R 286

27,401

Keating, D.A., Weiswurm, K. & Filson, G.W. MOVEMENT OF RESPIRED GAS IN MANNED SPACE ENCLOSURES. Aerospace Med., March 1965, 36(3), 206-210. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

The minimum atmosphere movement required for human respiratory support has never been determined since man's earliest thoughts of space flight. The purpose of this paper is to present research to aid in determining the movement and dispersion of respired gas in manned space enclosures during weightless flight. This research is based upon mathematical analysis and human and model experimentation. The effects of atmosphere movement produced only by respiration and diffusion are analyzed. This is the condition that exists in manned spacecraft without forced atmosphere movement during weightless flight for a sleeping or restrained astronaut. The determination considers an astronaut in an infinite space enclosure. The exhaled gas is considered to be injected into the infinite medium as 2 pulsating jets from a fixed source. Due to viscosity and momentum effects, the exhaled gas is slowed down by the surrounding fluid until the only means of gas dispersion is due to molecular diffusion. The amount of carbon dioxide which is inhaled is dependent upon the position and dispersion of the previous exhalations due to the effects of momentum, viscosity, and diffusion. The techniques of dimensional analysis and model theory are used to provide an experiment in the earth laboratory which represents the movement and dispersion of respired gas in a weightless space enclosure.

R 10

27,402

Lentz, E.C. HUMAN FACTORS IN "CAUSE UNDETERMINED" ACCIDENTS. Aerospace Med., March 1965, 36(3), 214-222. (USAF Life Sciences Div., Norton AFB, Calif.).

USAF aircraft accidents over a 4-yr period that remain categorized as cause undetermined indicate that the man-machine complex tends to fail during the stressful phases of flight. Loss of control and high speed impact are factors common to many of this series. Man's limitations and specifically his ability to maintain orientation--i.e., disorientation--are major problems in the operation of high performance aircraft. Aircraft performance has advanced to the place where exploration of the operational perimeters of the craft is reserved for the test pilot. Experienced combat pilots may still be novices with respect to the vagaries of the aircraft he flies. Safety of flight is enhanced by the division of duties with a qualified co-pilot.

27,403

Adams, C.R. & Hanff, G. SOME HUMAN FACTORS CONSIDERATIONS FOR ORBITAL MAINTENANCE AND MATERIALS TRANSFER. Aerospace Med., March 1965, 36(3), 223-230. (Lockheed-California Company, Lockheed Aircraft Corporation, Burbank, Calif.).

Scientific and tactical space missions will require support from units trained and equipped to perform a variety of extravehicular maintenance operations. The effective accomplishment of maintenance missions depends upon the extent to which man can adjust to the extravehicular space environment and his adjustment and performance are dependent upon the degree to which his sensory apparatus will continue to provide at least a basic repertoire of stimuli with which he is familiar. A preliminary task analysis was required to determine the performance levels of a human space-maintenance worker and to evaluate some of man's space-adaptive capacities. The preliminary analysis established certain tentative considerations expected to influence the maintenance mission. Basic among these were the following: shuttle vehicle design, design of vehicle upon which task will be performed, makeup of test, degree of automation involved in performance of task, accessibility of task area, techniques for task performance and effectiveness of tool design or modification. Certain basic assumptions were also enunciated; the worker would operate in an anthropomorphic suit and would possess the necessary motor skills and visuomotor coordination. The shuttle vehicle and the vehicle upon which the task would be performed would be joined by some sort of docking technique.

R 18

27,404

Coburn, K.R., Criag, P.H. & Beckman, E.L. EFFECTS OF POSITIVE G ON CHIMPANZEES IMMERSED IN WATER. Aerospace Med., March 1965, 36(3), 233-245. (USN Aerospace Crew Equipment Lab., Naval Air Engineering Center, Philadelphia, Penn.).

A concept for the prevention of the deleterious effects of high accelerative forces upon animals by immersing them in water in a "constant volume" G capsule has been proposed by Gray. A series of experiments were carried out to evaluate the validity of this concept by subjecting primates to accelerations of up to +31 Gz in such a system. The pathological and physiological findings of these experiments demonstrated that mediastinal emphysema and air embolism were produced in all animals by overpressurization of the lungs in the "constant volume" G capsule either during the acceleration period, or by pressurization of the lungs prior to centrifugation or by both mechanisms. In addition, circulatory failure occurred at the higher magnitudes of acceleration.

R 11

27,405

Wempe, T.E. EFFECTS OF GUST-INDUCED AND MANEUVERING ACCELERATION STRESS ON PILOT-VEHICLE PERFORMANCE. Aerospace Med., March 1965, 36(3), 246-255. (Ames Research Center, NASA, Moffett Field, Calif.).

A simulator study was conducted to assess the effects of gust-induced and maneuvering acceleration stress on pilot-vehicle performance during extended periods of low-level, high-speed flight. NASA test pilots were subjected to this acceleration stress on the Ames Height Control Simulator, a device capable of realistically reproducing the vertical acceleration environment of this flight mode. The primary piloting task consisted of "flying" as close as possible to a 250-foot clearance height above the terrain without ground contact by use of conventional aircraft controls while viewing aircraft instruments and a display depicting the terrain configuration ahead and below. Controlled variables were aircraft velocity, cockpit motion, gust intensity, additional secondary tasks, the presence of a bending mode vibration near the visceral resonance frequency and the requirement for monitoring an automatic terrain-following system.

R 6

27,406

Speckman, E.W., Smith, K.J., Vanderveen, J.E., Homer, G.M., et al. NUTRITIONAL ACCEPTABILITY OF A DEHYDRATED DIET. Aerospace Med., March 1965, 36(3), 256-260. (USAF 6570th Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Precooked, dehydrated and bite size compressed foods were arranged into a nutritionally balanced 4-day cycle experimental menu with 4 meals per day. A control menu composed of frozen, fresh and heat processed foods was prepared to match the experimental diet. The control and experimental diets were prepared and/or reconstituted with room temperature water and both diets were served at room temperature to 4 healthy college students for 20 days while they were confined to an experimental metabolic facility. A difference in the organoleptic quality of the experimental and control diets could not be ascertained in the duration of this study. No evidence of monotony was revealed in either diet during the 20-day feeding trial. Both diets were highly digestible when fed to human volunteers. Ss fed the control or experimental diet were maintained in nitrogen and energy balance. The Ss did not notice an increased gas production on either the control or experimental diet nor did they encounter gastrointestinal distress at any time.

R 27

27,407

Weinstock, M. EMERGENCY ESCAPE SYSTEMS FOR ARMY HELICOPTERS. Aerospace Med., March 1965, 36(3), 261-266. (USA Frankford Arsenal, Philadelphia, Penn.).

In an emergency the presence and location of the rotor blades above the helicopter fuselage obviate the use of the conventional upward escape trajectory. Therefore other escape trajectories were examined to determine their feasibility. One trajectory which appears promising is in the approximate shape of an "L." Design studies show that this arrangement is compatible with most helicopters. Dynamic tests of a full scale mocked-up system using standard escape system components in simulated ground level emergency escapes gave encouraging results. Aeromedical problems indicated by this study include an evaluation of the physiological effects on the escapee of high lateral and vertical acceleration pulses separated by a short interval of time and adequate means of body support. The solution of these problems will significantly improve the flight safety and survival capabilities of the personnel who operate military helicopters.

R 2

27,408

Brown, J.D. & Pulsifer, D.H. OUTPATIENT STARVATION IN NORMAL AND OBESE SUBJECTS. Aerospace Med., March 1965, 36(3), 267-269. (USAF 81st Tactical Hospital, APO 755, New York, N.Y.).

25 overweight personnel and 3 persons of normal weight were subjected to 10 days starvation as outpatients. Each was required to continue performing his routine duties and to walk 2 miles per day, while consuming only non-caloric liquids. 14 of the overweight personnel and all 3 of the normal Ss completed the 10-day fast and no serious ill effects or drops in job performance were noted. The severity of subjective symptoms, including irritability, easy fatigability and gastritis, were in indirect proportion to the obesity of the individual, being negligible in the obese and moderately severe in those of normal weight. The author suggests that on the basis of this study the Military should re-evaluate its present emphasis on the need for food in a survival situation, particularly in those circumstances following a nuclear event.

R 6

27,409

Wick, R.L., Jr. A FIVE-YEAR HISTORY OF SAILPLANE ACCIDENTS. Aerospace Med., March 1965, 36(3), 269-272. (Garrett Corporation, Los Angeles, Calif.).

Approximately 117 glider accidents have been reported during the 5-yr period 1958-1963, inclusive. 12 of these were fatal. Some of these pilots possessed medical certificates and some did not. Factors involved in sailplane flight and sailplane accidents are also presented. It is not possible at present to assess the value, if any, of a medical examination in the prevention of accidents among sailplane pilots.

R 5

27,410

Szafran, J. AGE DIFFERENCES IN SEQUENTIAL DECISIONS AND CARDIOVASCULAR STATUS AMONG PILOTS. Aerospace Med., April 1965, 36(4), 303-310. (Experimental Psychology Dept., Lovelace Foundation, Albuquerque, N.M.).

Attempts are currently being made to sketch an aging profile of capacities of pilots from physiological and psychological standpoints. In a sample of over 100 Ss representing a profession the practice of which requires making high-speed decisions, as well as an ability to receive and retain significant amounts of information whilst being fully engaged in routine control procedures, age differences in the relevant modalities of performance, as studied in the laboratory, are less impressive than might be expected from other data in the field of gerontology. Pilots over 40 yr. of age are relatively more susceptible than the younger to the effects of information overload, particularly if this involves short-term recall when some other activity intervenes during the period of retention. It is not clear, however, whether the conclusion that to this extent they may be said to possess less spare mental capacity than the young is really forced upon us by the data. There is evidence that a change of strategy in detecting low probability and low intensity signals may occur as a cumulative result of prolonged experience, and that this change can be highly resistant to the adverse effects of aging in selected individuals. These subtle variations in the coding and decoding operations performed by the brain appear to be related to cardiovascular status among perfectly healthy men.

R 28

27,411

Brown, A.E., Friedman, M., & Rosenman, R.H. AN INSTRUMENT FOR THE TOTALIZATION OF HEARTBEATS AND RESULTS OF ITS APPLICATION. Aerospace Med., April 1965, 36(4), 319-321. (Harold Brunn Institute, Mt. Zion Hospital, San Francisco, Calif.).

For several years the Harold Brunn Institute of Mt. Zion Hospital has been conducting studies on the occurrence of cardiovascular disease in people with a specific overt behavior pattern. These studies have been concerned with the increased incidence of clinical coronary artery disease in people who exhibit a strong sense of time urgency. In the course of these studies, it became desirable to be able to measure the total number of times a S's heart beat in a given 24-hr. interval. This article reports the development of a suitable instrument for this purpose. The parameter selected for the detection of the beating of the heart was the QRS complex of the ECG. 2 photographs and a diagram are included. Collection of the electrocardiographic signal is accomplished by a system of lead foil electrodes applied to the skin of the S by tape. The Heartbeat Totalizer was used in a research program concerned with the number of heartbeats occurring in 24 hr. in 3 groups of Ss. It was found that a group of Ss selected on the basis of a strong sense of time urgency (type A) would show a 400- to 700% greater incidence of clinical coronary artery disease than people exhibiting the converse behavior pattern (type B). There were 10 Type A and 11 Type B participants in the program. In general, the system was quite insensitive to interference.

R 5

27,412

Newsom, B.D., Brady, J.F. & Goble, G.J. EQUILIBRIUM AND WALKING CHANGES OBSERVED AT 5, 7 1/2, 10 AND 12 RPM IN THE REVOLVING SPACE STATION SIMULATOR. Aerospace Med., April 1965, 36(4), 322-326. (Astronautics, General Dynamics, San Diego, Calif.).

Rotation tolerance of man in space is difficult to analyze on earth because of the gravity artifact. In the operating space station centrifugal force will be nearly perpendicular to the floor and the velocity will be constant over the entire floor area. The data available in the literature have not considered these factors. The general acceptance of 4 RPM as a maximum rotation rate and 40 ft. as a minimum radius is a severe design restriction for an early space station. Careful examination of all factors used to define these limits must be made in order to be sure the tolerances described are close as possible to those to be found in space. For this reason a Revolving Space Station Simulator was constructed by modifying a 220,000 g lb. centrifuge. A room 7x8x14 ft. was suspended at an 18-ft radius by trunnions so the resultant force would be normal to the floor. Preliminary results of the equilibrium and walking tests performed at rotation rates above the presently accepted limits demonstrate a learning process and suggest that post rotational decrement is attributable to the acquired compensatory responses.

R 13

27,413

White, W.J. EFFECTS OF TRANSIENT WEIGHTLESSNESS ON BRIGHTNESS DISCRIMINATION. Aerospace Med., April 1965, 36(4), 327-331. (Missile & Space Systems Div., Douglas Aircraft Company, Inc., Santa Monica, Calif.).

Contrast thresholds of 6 semisupine, visually adapted Ss were obtained under short (10-14 sec.) periods of weightlessness and under 1 G control conditions. The target, viewed binocularly, subtended 1.5° and the background 2.6°. 3 background luminance levels were used: 0.03, 0.28 and 30.0 ft.-L. The contrast required to detect the target was found to be slightly, but consistently, lower under the weightless condition than under the control 1-G condition. Under the weightless condition the contrast required to detect the target averaged 12.56% at 0.03 ft.-L. background luminance, 6.49% at 0.28 ft.-L. background luminance and 3.99% at 30.0 ft.-L. background luminance. The corresponding contrasts required under the control 1-G condition averaged 15.14, 7.05 and 4.45% respectively.

R 10

27,414

Brady, J.F. & Newsom, B.D. LARGE EXCURSION ROTARY TRACKING OF TARGET AND TARGET LIGHT IN A SPACE STATION SIMULATOR REVOLVING AT 7.5, 10.0 AND 12.0 RPM. Aerospace Med., April 1965, 36(4), 332-342. (Astronautics, General Dynamics, San Diego, Calif.).

24 professional engineers, sedentarily employed, volunteered as test Ss to perform a rotary tracking test within a space station simulator revolving at 7.5, 10.0 or 12.0 RPM and aligned with the inertial resultant. Pretrained to asymptotic performance, they could be considered a select group only as to intelligence, motivation and histories of low motion sickness susceptibility. Exclusion of data on 11 of the Ss due to illness increased the selectivity of the results. It may be assumed, however, that the personal qualifications of a prospective astronaut for a similar task would be considerably greater. All RPM's showed minimal decrement, with rapid adaptation following Spinup and Spindown of the simulator. Performance at 10.0 RPM was significantly better than at the other 2 RPM's. This observed perceptual-motor ability, within a test format designed to elicit untoward Coriolis effects, suggests that satisfactory hand-eye coordinations can be performed in space vehicles rotating at velocities substantially above the tentative 4 RPM ceiling.

R 44

27,415

Eugster, J. WHAT DOES SPACE FLIGHT TEACH US? Aerospace Med., April 1965, 36(4), 345-350. (University of Zurich, Zurich, Switzerland).

It is marvellous that today information from more than 5,000,000 kilometers out in space can be recorded on a piece of ticker tape 50 kilometers long. In just 8 times that distance our nearest neighbor, Venus, can be contacted. One of the disappointments is already apparent in recent measurements of cosmic radiation, especially of solar plasma. At certain altitudes this radiation presents formidable hazards to a space traveler so that his route must be limited to very specific orbits. As a result we shall have to rely on unmanned flights for progress in the years immediately ahead. The most dramatic breakthroughs are expected in the category of interplanetary matter, either in clarification of the panspermia hypothesis or in the direction of space chemistry. These advances, along with anticipated analysis of a lunar dust sample, will bring us closer to solving the mystery of biological origins on earth. Space medicine, naturally, occupies the most prominent place in cosmobiological research today. In the next few years it will yield valuable information for future manned space flights.

R 17

27,416

Hauty, G.T., Trites, D.K. & Berkeley, W.J. FREQUENCY OF SHIFT ROTATION AT AIR TRAFFIC CONTROL FACILITIES AND INCIDENCE OF STRESS-RELATED SYMPTOMS. Aerospace Med., April 1965, 36(4), 350-356.

From 6 enroute and 6 terminal air traffic control facilities selected on the basis of differences between shift rotation schedules and high traffic volume, 300 journeymen and assistant controllers were selected as volunteer Ss to complete a biomedical inventory daily for a period of 90 consecutive days. The inventory elicited information relating to health, morale, behavioral habits, and side effects of medications. Of the 300 Ss, 209 fulfilled the reporting requirements of the 90 days. For one of the indices of information--stress-related symptoms-- analyses of the data revealed that: a) facilities did differ to a statistically significant degree in the incidence of reported symptoms but these differences could not be attributed to shift rotation schedules and b) 8 hr. or less between 2 successive shifts occasioned the highest incidence of reported symptoms and more than 24 hr. between shifts the next highest.

R 4

27,417

Davis, J.C. & Beyer, D.H. PERSONAL HABITS AMONG USAF AIRCREW MEMBERS; A SURVEY. Aerospace Med., April 1965, 36(4), 357-360. (USAF School of Aerospace Med., Aerospace Medical Div., Brooks AFB, Tex.).

A survey was conducted among 1,960 flying personnel at 98 United States Air Force bases to obtain information on certain personal habits. 1/2 of the questionnaires were anonymous and the remainder required identification. The response rate was equal in the 2 groups (55.5%) and no significant differences were found in the habits reported by them. 1.0% of the men took unacceptable self-medication while on flying status but only 1 man took a potentially hazardous drug while flying. 51.5% of the men are cigaret smokers. On the average day 74.8% of the men had either no alcohol intake or the equivalent of 2 drinks or less. Of 125 pilots 16.8% ate no breakfast and 32% had a coffee, juice and roll breakfast only on a day when they were flying.

R 9

27,418

Kiel, F.W. SURVEY OF MILITARY SPORT PARACHUTING DEATHS. Aerospace Med., April 1965, 36(4), 360-362. (US Armed Forces Institute of Pathology, Washington, D.C.).

Sport parachuting has become a popular activity with military personnel, and many clubs have been organized and sponsored on bases throughout the world. As the number of jumpers has increased so has the number of deaths increased. There have been 27 military persons killed in sport parachuting through June 1964. In addition to the large problem of failure to activate the parachute there are other hazards also, such as hitting the airplane, colliding with another jumper, malfunctioning of the chute and landing in the water. Analysis of the accidents shows that 1/3 occurred during the preliminary training period but in others jumpers with long experience have died also. Wind appears to be a factor in inadvertent water landings, but other weather factors lack importance.

R 1

27,419

Hawrylewicz, E.J. & Blair, W.H. BIOCHEMICAL MEASURE OF IMPACT STRESS IN CHIMPANZEES. Aerospace Med., April 1965, 36(4), 369-371. (Life Sciences Div., IIT Research Institute, Chicago, Ill.).

5 chimpanzees were subjected to various G forces from 54 to 180 G. Serum lactic dehydrogenase (LDH) and LDH isoenzymes were determined before the G stress and 1 hr, 24 hrs, and 7 to 11 days after exposure. Total LDH increased 2- to 3-fold 1 hr after the stress and was still elevated 24 hrs later, with a return to normal limits 7 to 11 days later. LDH isoenzymes were abnormal 1 hr after G stress, with a decrease in bands 1 & 2 and marked elevation in bands 4 & 5. This shift in isoenzymes was still apparent 24 hrs later. At the pre-autopsy period (7 to 11 days after stress) the abnormal isoenzyme pattern shifted to an increase in bands 1 & 2 or the 3 chimpanzees alive at this time. The alteration in serum LDH and LDH isoenzymes appears to be a result of the impact stress. The change in isoenzyme pattern 7 to 11 days later probably reflects the adaption of the organism to the initial stress and the development of post-impact pathology.

R 9

27,420

Courts, D.E. & Pierson, W.R. SPORT PARACHUTING AND HYPOXIA. Aerospace Med., April 1965, 36(4), 372-374. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

This study was conducted to determine the effects of relatively mild hypoxia upon the intellectual and motor functions of Ss exposed to conditions experienced by parachutists when jumping above 10,000 ft. 6 Ss were decompressed to 15,000 ft. in a low pressure chamber and exposed at that altitude for 23 min. The Ss, who also acted as their own controls in subsequent experiments, were given 3 tests involving estimation of time duration, digit retention and repetition, and muscular reaction time. The Ss were then exposed to the same test conditions; however, this time with the use of supplemental oxygen. No significant difference in performance could be demonstrated between the test and control trials.

R 18



27,421

Nixon, C.W. HUMAN RESPONSES TO SONIC BOOM. Aerospace Med., May 1965, 36(5), 399-405. (USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio).

Human reaction to the sonic boom is a product of the stimulus, the immediate environment in which the boom occurs and the numerous attitudinal variables brought into the situation by the individual. The wide variability associated with each of these factors prohibits the establishment of direct relationships among them and human responses. Consequently the formation of a predictive scheme for human response to sonic boom has not been accomplished. Some general conclusions of a preliminary nature based upon the preceding discussion are as follows: a) Sonic boom is an undesirable by-product of supersonic flight which will not be eliminated in the foreseeable future. When sonic booms occur there will be human reaction to them. b) No evidence has been obtained to suggest direct personal injury resulting from the sonic boom. Substantial evidence shows that no direct injury has been reported, even in response to sonic boom exposures many times greater than those experienced by typical communities. c) Psychological reactions of individuals are not predictive due to large variations in the stimulus, the immediate environment and the attitudinal variables which may be related or unrelated to the boom experience. d) The community reaction pattern proceeds from a high initial negative response or objection to a level of accommodation and acceptance where it may remain indefinitely provided no unusual exposure occurs. e) Currently the most promising approach to the operations problem is that of controlling flight profiles of supersonic missions in terms of increased altitudes and care in acceleration and maneuver. Although sonic boom has in the past been primarily a problem associated with supersonic flight by the U.S. Armed Forces, current national and international interest in a commercial supersonic transport has stimulated in other agencies a keen interest in the problem. The FAA, NASA, aircraft manufacturers, commercial airlines and other governmental officials, including the Air Force, are all actively engaged in various investigative tasks relative to the problem.

R 8

27,422

Simons, J.C., Walk, D.E. & Sears, C.W. MOTION PERFORMANCE OF PRESSURE-SUITED SUBJECTS UNDER ZERO AND LUNAR GRAVITY CONDITIONS. Aerospace Med., May 1965, 36(5), 406-414. (USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio).

The motions of unsuited and pressure-suited Ss were studied as they performed lunging, egressing and landing tasks during the weightless and lunar gravity maneuvers of a large cabin in aircraft. Performance data are presented for various combinations of clothing, gravity and body position conditions. Time and contact data are presented for the egress motion as it is influenced by changes in the exit diameter. Motions of suited Ss generally required 30% more time than corresponding motions of unsuited Ss under both gravity levels. Most motions required 35% more time during zero-G than during lunar-G. No significant differences in egress time were found for 4 body-position configurations. 5 in. of exit clearance improved egress time by 6%. Accuracy of motion rather than time of motion appeared to be a more sensitive measure of operator performance for the egress task.

R 11

27,423

Lorentzen, F.V. OXYGEN CONSUMPTION DURING FLIGHT AT MODERATE G. Aerospace Med., May 1965, 36(5), 415-417. (Aviation Medicine Institute, Oslo, Norway).

The oxygen consumption during a strenuous flying program lasting for 6-8 minutes corresponded to about or somewhat higher than 300 kgm/min. The uptake was down to almost resting levels 1-2 minutes after the G load which might seem to be in contradiction to some other investigations. The difference may be explained by difference in duration and size of G and by the different methods used.

R 5

27,424

Degner, E.A., Ikels, K.G. & Allen, T.H. DISSOLVED NITROGEN AND BENDS IN OXYGEN-NITROGEN MIXTURES DURING EXERCISE AT DECREASED PRESSURES. Aerospace Med., May 1965, 36(5), 418-425. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

4 types of simulated orbiting laboratory flights of 10 to 21 hours' duration, involving 107 man-flights and 93 analyses of N<sub>2</sub> dissolved in blood, were performed for the purpose of ascertaining the average intensity and duration of bends pains. Generally bends occurred most often during transfer and reconnaissance. Once bends appeared it reoccurred in subsequent flight stages. This can be avoided by sufficient breathing of O<sub>2</sub> such that blood N<sub>2</sub> falls to levels insufficient, theoretically, to provide enough N<sub>2</sub> molecules to form seed bubbles. On this basis it can be predicted that missions in a pure O<sub>2</sub> environment require 120 minutes of O<sub>2</sub> breathing at 14.5 psia before decompression to 5 psia and an additional 375 minutes before a second decompression to 3.5 psia. At that time one could return to 5 psia O<sub>2</sub> or preferably to 46:50:0<sub>2</sub>:N<sub>2</sub> at 7 psia; the latter takes 33 minutes of O<sub>2</sub> breathing before recontingering at 3.5 psia. If pressure suits and locks operated successfully at 5 instead of 3.5 psia, O<sub>2</sub> breathing time could be saved and danger of bends avoided.

R 29

27,425

Barron, C.I. & Cook, T.J. EFFECTS OF VARIABLE DECOMPRESSIONS TO 45,000 FEET. Aerospace Med., May 1965, 36(5), 425-430. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

Tests were conducted to determine the effects of decompression from 8000 to 45,000 ft at rates of 5 to 38 sec on 4 civilian test pilots and 4 passenger Ss. Masks of several types currently in use in transport and business aircraft were worn or donned at varying intervals of exposure. Physiological measurements and cellular enzyme determinations were recorded in all tests, and performance and communication studies were conducted on the pilots. Results of the tests revealed inability of Ss to complete all pretest instructions. Extreme reactions of varying degree occurred in the 3 Ss exposed to the 5-sec decompressions. Jerking movements occurred in 2 of the Ss who did not apply their masks for periods of 5 to 6 sec after reaching maximum altitude. Encephalographic changes, indicative of severe hypoxia, occurred in these cases between 16 to 40 sec after the start of decompression. Performance and communications were adversely affected in all pilots undergoing decompression without wearing a mask; however, enzyme changes were nonsignificant. The passengers had difficulty in applying the mask properly. The study confirmed the findings of other investigators in noting that unless 100% oxygen was inspired within 5 to 7 sec after exposure to 45,000 ft, unconsciousness would occur at 13 to 16 sec. The test emphasized the necessity for wearing an oxygen mask during all rapid decompressions to 45,000 ft and the desirability of improvement in oxygen dispensing devices for passengers.

R 7

27,426

Gagge, A.P., Stowijk, J.A.J. & Hardy, J.D. A NOVEL APPROACH TO MEASUREMENT OF MAN'S HEAT EXCHANGE WITH A COMPLEX RADIANT ENVIRONMENT. Aerospace Med., May 1965, 36(5), 431-435. (Physiology Dept., Yale University School of Medicine, New Haven, Conn.).

Unclothed Ss in a sitting position were exposed to a variable source of thermal radiation (2-1500 watt quartz heaters). Ambient temperatures varied between 15°C-32°C; air movement (less than 7 cm/sec) and relative humidity (less than 30%) were constant for all experiments. Total heat loss by evaporation was evaluated from a continuous record of the Ss' weight loss while resting on a sensitive platform scale. 2 series of experiments were performed: a) the change in evaporative loss with increasing heater wattage was observed, while the ambient temperature ( $T_a$ ) was constant in range 30°-32°C and b) the S was allowed to choose the heater wattage necessary for sense of comfort and thermal neutrality, while the ambient temperature varied over range 15°-30°C. From these 2 series, it can be shown: a) a change in evaporative loss E corresponds to the radiant heat ( $H_r$ ) absorbed by the body from the lamps; b) the slope of the radiant heat ( $H_r$ ) selected for comfort and neutrality when plotted against dropping ambient temperatures ( $T_a$ ) is equal to the environmental constant, h. This constant describes how heat is lost by radiation plus convection from a skin surface at average temperature  $T_s$  to a uniform environment at temperature  $T_a$ . Thus it is possible, by using the human body as a radiometer (Exp. 1) and as a null point sensor (Exp. 2) of comfort-thermal neutrality, to describe quantitatively its heat exchange in a complex radiant environment and to evaluate the operative temperature, (i.e.  $T_a + H_r/h$ ).

R 6

27,427

Teacher, C.F. & Piotrowski, C.F. VOICE SOUND RECOGNITION. FINAL REPORT APRIL 1964-APRIL 1965. Contract AF30(602) 3384, Proj. 4027, RADC TR 65 184, July 1965, 140pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Philco Corporation, Blue Bell, Penn.). (AD 619964)

This report examines the merits of a new speech perception theory and its application to the voice sound recognition problem. Most conventional speech recognition systems require 7 important parameters to activate the recognition logic: the frequency of the first 3 formants, the amplitude of the first 3 formants and a voice-unvoiced decision. The theory tested uses just 3 important parameters: the frequency of a "single equivalent formant" (SEF), the SEF amplitude, and a voicing decision. This decrease of more than 2 to 1 in input parameters should mean significantly more than a 2 to 1 reduction in the complexity of the recognition logic. Statistics were compiled on a set of 20 words uttered by an ensemble of 5 speakers (3 male and 2 female). Although some recognition confusions were encountered in some phonetically similar sounds they were not unexpected, since the statistics were compiled on segmented phonemes (sans transient cues). However, other confusions were the result of imperfect parameter extractors, and hopefully will be corrected as improved circuits are developed. Recognition rates as high as 98% were measured in this initial phase of the program.

R 4

27,428

Vogt, F.B. EFFECT OF EXTREMITY CUFF-TOURNIQUETS ON TILT TABLE TOLERANCE AFTER WATER IMMERSION. Aerospace Med., May 1965, 36(5), 442-447. (Texas Institute for Rehabilitation & Research, Houston, Tex.).

Tilt table intolerance of 4 healthy adult young males was studied in 2 water immersion experiments of 6 hours duration in an effort to reproduce a previous study reporting a protective effect from cuff-tourniquets applied to the extremities during immersion. Body weight, fluid intake, urine output and leg circumference measurements were made and recorded. After the first period of 6 hours of water immersion 3 of the 4 Ss experienced syncope during a tilt table test. Compared to pre-immersion tilt tests all Ss experienced marked changes in changes in heart rate or blood pressure during tilting after immersion. A significant diuresis was not noted. During the second period of immersion cuff-tourniquets were applied to the 4 extremities and inflated to a pressure of 60 mm Hg, with a 1-min-on, and 1-min-off cycle. Some degree of protection against tilt table intolerance after immersion was provided in this test; none of the 3 Ss experienced syncope or showed the marked blood pressure changes they had shown on the previous immersion test without cuffs.

R 31

27,429

Vogt, F.B. & Johnson, P.C. STUDY OF EFFECT OF WATER IMMERSION ON HEALTHY ADULT MALE SUBJECTS: PLASMA VOLUME AND FLUID-ELECTROLYTE CHANGES. Aerospace Med., May 1965, 36(5), 447-451. (Texas Institute for Rehabilitation & Research, Houston, Tex.).

4 healthy adult males were studied during 2 water immersion experiments of 6 hours duration. During the second experiment cuff-tourniquets were applied to all 4 extremities of each S to test the effect in preventing or lessening the cardiovascular deconditioning associated with water immersion. The use of the cuff-tourniquets was found to be partially effective. Repeated plasma volume, hemoglobin, hematocrit and serum sodium, potassium, osmolarity and protein determinations were performed and are reported. Fluid intake, urine output and body weight measurements were made and are reported. An increased rate of transfer of intravascular compartment is suggested as one of the possible factors responsible for the symptoms observed during tilt table tests after water immersion.

27,430

Dowd, P.J. RESISTANCE TO MOTION SICKNESS THROUGH REPEATED EXPOSURE TO CORIOLIS STIMULATION. Aerospace Med., May 1965, 36(5), 452-455. (USAF Aerospace School of Medicine, Brooks AFB, Tex.).

This report presents information of a method of repeated self-induced Coriolis stimulation, using 4 conditions: chair tilt, head movements in the lateral plane, head movements in both lateral and frontal planes and head movements only in the frontal plane, on the SAM bi-axial stimulator. The S, an Air Force Academy cadet, senior class, was evaluated for vestibular sensitivity after several incidents of motion sickness during flight training on the T-37 aircraft. Final testing after completion of this programmed self-induced Coriolis stimulation indicated a resistance to motion sickness as determined from general autonomic reactions and data analysis of electronystagmograms. The S has completed his solo-flight training on the T-37 aircraft without any report of motion sickness.

R 18

27,431

Jones, G.M. DISTURBANCE OF OCULOMOTOR CONTROL IN FLIGHT. Aerospace Med., May 1965, 36(5), 461-465. (Physiology Dept., McGill University, Montreal, Quebec, Canada).

An over-all analysis of the physiological processes contributing to stabilization of the retinal image reveals 4 main sensory and 3 main motor information channels. The 3 motor outputs operate on 3 discrete anatomical platforms described as the eye-in-skull, the skull-on-body and the body-in-space. Probably all of these are used in everyday life, although apparently different species of animals preferentially employed different platforms. Detailed consideration of the visual tracking and vestibulo-ocular mechanisms disclose a number of limitations imposed on the over-all system by the flight environment. Specifically, those here considered are the limited response of visual tracking, virtual absence of visual tracking in the roll plane, the vestibular errors introduced by prolonged turning and the predominance of an anti-compensatory vestibulo-ocular response during rapid head rotation.

R 18

27,432

Dougherty, J.D., Caldwell, J.C., Howe, W.M. & Clark, W.B. CLINICAL PROBLEMS IN AVIATION MEDICINE: EVALUATION OF AN ALLEGED CASE OF RADIATION INDUCED CATARACT AT A RADAR SITE. Aerospace Med., May 1965, 36(5), 466-471. (US Federal Aviation Agency, Washington, D.C.).

In reviewing the evaluation several features appear worthy of comment: a) Early education of employees in radiation hazards is essential for environments such as this radar site; b) Thorough screening of the site before operation should be documented and explained to the employees; c) Changes in operating procedures which present new hazards, not surveyed, must be subject to engineering review and be medically monitored; d) Prompt, accurate medical evaluation should be the first order of business in any new case; e) The creation and training of a radar safety team is invaluable when a real hazard is suspected. Prior practice and training proved essential to us and should to future teams; f) As all weather, sea and air traffic control increase throughout the world so too will radar control, bringing this problem to organizations where personnel are not so cooperative or well-trained. The lower the general educational level the more importance attached to employee training in radiation hazards.

R 6

27,433

Spoendlin, H.H., Schuknecht, H.F. & Graybiel, A. ULTRASTRUCTURE OF THE OTOLITH ORGANS IN SQUIRREL MONKEYS AFTER EXPOSURE TO HIGH LEVELS OF GRAVITOINERTIAL FORCE. Aerospace Med., June 1965, 36(6), 497-503. (University of Zurich, Zurich, Switzerland).

11 squirrel monkeys were exposed to gravito-inertial force of either 5.43 or 10.92 G units for periods up to 10 min. in different body (head) positions. 3 animals died. The nature of the head support was believed to be responsible in 2 and headward (negative) acceleration in the other. Gross examination of the brains revealed no pathological changes. Following centrifugation some of the monkeys manifested ataxia and other disturbances which disappeared in mins. or hrs. Human Ss have experienced some of the manifestations following high G loadings. The ultrastructure of the maculae, as revealed by electron-microscopy, was not altered in any of the animals exposed to high G stress. A detailed account of the findings in these and normal control animals is given and includes some new observations. It was concluded that exposure to gravito-inertial forces greater than 10.92 G units is necessary before physical alterations in fine structures of the macula can be demonstrated in squirrel monkeys. The possibility was not ruled out that the clinical manifestations had their genesis in the semicircular canals. If the G loadings in this experiment are not exceeded in orbital space flights alterations of the macula would be ascribable to other causes, including the prolonged deafferentation associated with weightlessness.

R 32

27,435

Roman, J. LONG-RANGE PROGRAM TO DEVELOP MEDICAL MONITORING IN FLIGHT. THE FLIGHT RESEARCH PROGRAM-I. Aerospace Med., June 1965, 36(6), 514-518. (Flight Research Center, NASA, Edwards AFB, Calif.).

NASA's Flight Research Center is conducting a long-range program designed to advance the state of the art in biomedical monitoring. Better knowledge of the physiological parameters used in monitoring the crew is one of major aims of the program. An instrumentation-development phase and a phase involving development of computer techniques for handling medical flight data both contribute to the overall program. The physiological-parameters-research phase and the instrumentation-development phase have yielded significant results after 1 yr of operation.

R 3

27,436

Roman, J. RISK AND RESPONSIBILITY AS FACTORS AFFECTING HEART RATE IN TEST PILOTS. THE FLIGHT RESEARCH PROGRAM-II. Aerospace Med., June 1965, 36(6), 518-523. (Flight Research Center, NASA, Edwards AFB, Calif.).

In 37 flights in a 2-place high-performance aircraft, or 35 hr. of instrumented flying time, physical risk or danger did not appear to be a primary causative factor in producing the high heart rates frequently seen in high-performance-vehicle operation. Responsibility for the mission appeared to be a more potent factor. It is recognized that the responsibility factor is not clearly defined and encompasses many variables.

R 8

27,437

Cardus, D., Vallbona, C., Vogt, F.B., Spencer, W.A., et al. INFLUENCE OF BEDREST ON PLASMA LEVELS OF 17-HYDROXYCORTICOSTEROIDS. Aerospace Med., June 1965, 36(6), 524-528. (Baylor University College of Medicine, Houston, Tex.).

Plasma levels of 17-hydroxycorticosteroids at 0800, 1200, 1600, 2000 and 2400 hr. were determined on 6 healthy Ss who were submitted to 2 3-day periods of bedrest. During the first period the Ss were in bedrest only. During the second a program of isometric exercises was added to bedrest. The determinations of 17-hydroxycorticosteroids in plasma were made with a modification of the Peterson method and the Porter-Silber technique. During bedrest the peak level at 0800 seemed a little lower than the peak values observed while the Ss were ambulatory but the difference was not statistically significant. Bedrest did not modify the circadian rhythm of 17-hydroxycorticosteroids in plasma. During the period that isometric exercises were added to bedrest the rhythm and the levels of 17-hydroxycorticosteroids were normal. 1 to 2 days bedrest has no effect on the circadian rhythm of 17-hydroxycorticosteroids.

R 12

27,438

Hill, J.H., Chisum, Gloria, T. NATURE OF RADIATION FROM NUCLEAR WEAPONS IN RELATION TO FLASHBLINDNESS. Aerospace Med., June 1965, 36(6), 528-532. (USN Air Development Center, Johnsville, Penn.).

The minimum information about a weapon flash necessary for research and development purposes in regards to the problem of flashblindness is luminance, duration and visual angle subtended by the source whether it is a fireball or a surface illuminated by the fireball. The estimation of these parameters from information given in Department of the Army Pamphlet 39-3, The Effects of Nuclear Weapons, is discussed.

R 2

27,439

Flinn, D.E. FUNCTIONAL STATES OF ALTERED AWARENESS DURING FLIGHT. Aerospace Med., June 1965, 36(6), 537-544. (USAF Office of the Surgeon General, Washington, D.C.).

Occasionally transient states of altered awareness which are not organic or physiological in origin are seen in flyers. These include lapses of attention, trance states, dream-like states and related subjective experiences. These are often minor disorders of the type which in a more severe form are known clinically as dissociative reactions. Various factors are implicated in their onset, including the monotonous aspects of the flying environment, anxiety, fatigue, sensory overload, narrowed attention and underlying psychopathology in the individual. In the past 7 yrs 21 patients have been referred to the USAF School of Aviation Medicine because of episodes of this type. While these conditions are not always a significant threat to flying safety it may be difficult to differentiate them from disorders which are. Decision regarding return to flying status in these cases must be made individually, based upon the demonstrated degree of interference with performance and the underlying emotional suitability of the individual.

R 29

27,440

McFadden, E.B., Garner, J.D. & Masier, R.A. DEVELOPMENT OF A TRITIUM SELF-LUMINOUS LIFE RAFT LIGHT SOURCE. Aerospace Med., June 1965, 36(6), 548-551. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

A self-luminous light source utilizing tritium gas, a radioactive isotope of hydrogen, and a zinc sulfide phosphor is described. The sources are primarily designed to provide survivors emerging from the ditched aircraft, or already in the water, with a visible identification of the location and attitude of the life raft and boarding stations. 2 sizes of tritium light sources were designed and tested. 8 3-in. sources of 425 microlamberts each of brightness were fabricated for use on the periphery of a 25-man life raft. 2 6-in. sources of 225 microlamberts each were fabricated for use at the boarding station. Special geometry of the sources allows visibility angles in excess of 180°. Emission of visible light is continuous and not dependent upon an external source of energy. Reduction in brightness is a function of the half-life of tritium (12.6 yrs). The use of self-luminous safety devices utilizing tritium is approved by the Atomic Energy Commission and presents no radiation hazard to crew or passengers.

R 3

27,441

Bruener, H., Klein, K.E., Ruff, S. & Wegmann, H.M. FATIGUE-STUDIES ON OVERSEAS FLIGHTS. Aerospace Med., June 1965, 36(6), 552-553. (Institut für Flugmedizin, Koernerstrasse, Germany).

Studies were made on aircrew personnel during transatlantic flights from Frankfurt to New York and return. We found a "natural" depression of the circulatory parameters in the diurnal fluctuation during the night hours. It is probably caused by vagotonia. A depression found after long hours of mental work should have the same cause: a relative vagotonia, and should be an expression of a relative state of fatigue. This interpretation would best explain and also agree with the results we obtained with other physiological parameters. However, the practical significance of this conclusion is not within the field of study of this report.

R 14

27,442

Catlett, G.F. & Kidera, G.J. RESPONSE TO CARBOHYDRATE LOADING AS A CRITERION IN COMMERCIAL PILOT SELECTION. Aerospace Med., June 1965, 36(6), 554-557. (Medical Dept., United Air Lines, Chicago, Ill.).

Diabetes mellitus is a major cause of medical grounding among pilots employed by United Air Lines, yet the disease is seldom discovered in pilot selection examinations. This study was designed to evaluate the feasibility of screening latent diabetes by use of a single blood glucose determination after administration of a loading dose of carbohydrate and to compare this method with the traditional random urinalysis. The procedure was performed on 157 pilot applicants who were without history of metabolic disease and whose initial urines were sugar free. 17 of the group showed a glycosuria or elevated blood sugar after loading and of these 7 demonstrated sufficient carbohydrate intolerance to warrant rejection. The random urinalysis appears inadequate as a selection test and should be replaced by some evaluation of glucose tolerance.

R 13

27,443

Dougherty, J.D. LAKEFRONT AIRPORT, AN EPIDEMIOLOGIC APPROACH. Aerospace Med., June 1965, 36(6), 558-561. (Harvard School of Public Health, Boston, Mass.).

With the increasing number of aviation-wise physicians, airports offer a productive opportunity for accident studies. Epidemiological evaluation of New Orleans Lakefront Airport provides an example for interest physicians. The unique physical location of New Orleans Lakefront makes spatial disorientation a common occurrence to aircraft in the traffic pattern at night and/or on reduced visibility. Proficiency varied widely among pilots of fatal crashes. Several common factors, such as low visibility, darkness and type of aircraft, are considered. Traffic pattern operations by a non-instrumented pilot indicated a method by which coriolis may be induced in the traffic pattern. 2 accidents, typical of spatial disorientation, are noted, as was the high fatality rate/1,000,000 for night operations for this airport. Local aviation medical examiners are suggested to be ideally equipped to compile and analyze longitudinal studies of airport safety.

R 7

27,444

Paul, A. EFFECTS OF SLEEP DEPRIVATION ON VISUAL FUNCTION. Aerospace Med., July 1965, 36(7), 617-620.

20 students, 18 yrs. of age, were deprived of sleep for 50 hrs. Before, during and after this period of sleep deprivation visual examinations were repeated at intervals, testing visual acuity, muscle balance, stereoscopic vision, tachistoscopic perception and color vision. Only after 46 hrs. of sleeplessness was a very small decrement noticed. It is interesting to note that the changes, as far as such were found, are of a very small magnitude and quantitatively do not seem to amount to very much. Visual acuity at far ranged at all times between 20/17 to 20/19, which is a very small change indeed. The visual acuity at near was at all times between 20/17 and 20/18, which can hardly be called a change in findings. There was only a one diopter change in the phoria findings for far and up to a 3 diopter change in the phoria findings for near. The results of the stereoscopic tests also show a very small difference due to lack of sleep, even after 46 hrs. After a short period of sleep (5 hrs.) visual function returned to its original state.

R 10

27,445

Hoeft, L.O. MICROWAVE HEATING: A STUDY OF THE CRITICAL EXPOSURE VARIABLES FOR MAN AND EXPERIMENTAL ANIMALS. Aerospace Med., July 1965, 36(7), 621-622. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Extrapolating the results of microwave heating experiments from various species of animals to man has been done frequently without accounting for interspecies differences in mass and size. The objective of this study was to derive a theoretical basis for extrapolation and to suggest ways to improve experiments designed to investigate nonthermal effects of microwaves. The exposure times required to produce a 5° C temperature rise in man and experimental animals were calculated as a function of the microwave intensity using a simplified model. These calculations show that, while the intensity for which infinitely long exposures are permitted is approximately the same for all species, higher intensities will elevate temperatures quicker in small animals than in larger ones. This difference in heating rates should be taken into account in experiments designed to investigate the nonthermal effects of microwaves.

R 6

27,446

Kreindler, L.S. SOME LEGAL RAMIFICATIONS OF AIRCRAFT ACCIDENTS. Aerospace Med., July 1965, 36(7), 629-631. (Kreindler & Kreindler, New York, N.Y.).

The basic concepts of aviation accident litigation are presented in this paper. The American system of law, how it works, and how the system functions with respect to particular aircraft accidents is explained. This American system of "tort liability," is defined and compared with a "compensation system." Compensation under the tort system depends on proof of negligence. Litigation in military and civilian accidents is compared. (HEIAS)

27,447

Madole, D.W. INTERNATIONAL ASPECTS OF AIRCRAFT ACCIDENTS. Aerospace Med., July 1965, 36(7), 632-634. (US Civil Aeronautics Board, Bureau of Safety, Washington, D.C.).

This article consists of an extensive example concerning international aspects of aircraft accidents which illustrates the following principle: The state of occurrence is responsible for the accident investigation, including official identification, pathological examinations and the human factor determinations. The internationally recognized right of access to casualties, both dead and alive, resides with the state of occurrence and the state of registry. (HEIAS)

27,448

Colley, W.J. & Kiel, F.W. SOME ASPECTS OF GOVERNMENT LIABILITY IN MILITARY AIRCRAFT ACCIDENTS. Aerospace Med., July 1965, 36(7), 635-636. (US Armed Forces Institute of Pathology, Washington, D.C.).

Liability of the U.S. government for military aircraft accidents is based on statutes enacted in Congress. With 30,000 military aircraft being involved in 1,300 accidents per year, resulting in 500 deaths, there is an increasing need for adequate compensation to injured persons. The Federal Tort Claims Act and the Military Claims Act are 2 major laws allowing recovery against the United States. The courts have held, however, that military personnel on active duty may not recover from the government for injuries received incident to service. In certain circumstances the injured serviceman may be able to sue successfully the original manufacturer of the aircraft.

27,449

Mason, J.K. & Tarlton, S.W. MULTIPLE DISINTERMENTS IN EQUATORIAL AFRICA. Aerospace Med., July 1965, 36(7), 636-639. (RAF Institute of Pathology & Tropical Medicine, Halton, Bucks, England).

This article reports an illustrative accident in which an insufficient pathological examination was made. The history and significance of the accident are included. The "lessons to be learned" from such an accident are discussed at length. The following suggestions are regarded as minimal requirements in an investigation: a) All the bodies should be examined at least externally and careful notes made as to their injuries; b) The bodies should be completely undressed and all jewelry and ornaments removed, the clothing and belongings being kept together in a container numbered to correspond with the body and coffin; c) All bodies should be photographed, with particular attention to any identifying marks such as tattoos or unusual scars; d) Any available dentures should be removed and clearly labelled and, if time is available, full dental records should be prepared. There may also be a case for preservation of head hair.

27,450

Breitenecker, R. PROBLEMS OF MASS CASUALTIES IN AIRCRAFT ACCIDENTS. Aerospace Med., July 1965, 36(7), 639-640. (Baltimore, Md.).

The purpose of identification and examination of mass casualties is threefold: a) humanitarian aspects; b) investigational aspects, e.g., careful examination of the remains may provide clues to the cause of the accident and death; and c) legal aspects. Identification procedures are described for an accident in which a large number of bodies were severely disintegrated. The 3 most valuable means of identification proved to be: a) fingerprints; b) dental characteristics; and c) physical characteristics. (HEIAS)

27,451

Stevens, P.J. PRACTICAL PROBLEMS ARISING IN THE INVESTIGATION OF AIRLINE DISASTERS ABROAD. Aerospace Med., July 1965, 36(7), 641-646. (RAF Institute of Pathology & Tropical Medicine, Halton, Bucks, England).

The problems of investigating aircraft accidents overseas will vary somewhat from accident to accident and the solution of many of them will inevitably be made on an ad hoc basis and will largely depend upon the tact and diplomacy of the people concerned. However, there are 2 conclusions which are worth underlining for something can be done about these in advance. First, arrangements should be such that the arrival of the medical adviser to the accredited representative at or near the scene of accident should be effected with the minimum of delay. This is absolutely essential if errors of omission and commission are not to be made at the outset, and if a working arrangement is to be achieved with local police and pathologists without initial misunderstanding. The pathologist should be near the top of the list of those to be informed when an aircraft is reported missing and presumed crashed or when it is known that an aircraft has crashed. Every effort should be made to see that he is with the first party from the country of registration to arrive at the scene of the accident.

R 4

27,452

Davidson, A.F. INVESTIGATION OF DITCHING ACCIDENTS. Aerospace Med., July 1965, 36(7), 646-648. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

3 ditching accidents involving aircraft in service in the Royal Navy are described and the third is discussed in detail. Mechanical assistance to aid rapid exit of aircrew from the cockpit of a sinking aircraft is recommended. It is considered advantageous to have a specialist in aviation medicine, who is a qualified diver, at the scene of the accident as soon as possible after the wreckage has been located so that a preliminary investigation can be carried out under water.

27,453

Doyle, B.C. & Roepe, R.A. A STUDY OF UNITED STATES AIR CARRIER WATER ACCIDENTS, JULY 1954-JUNE 1964. Aerospace Med., July 1965, 36(7), 648-658. (US Civil Aeronautics Board, Washington, D.C.).

All factors being equal, premeditated ditchings should have an equal or greater number of survivors than a forced landing on land, if adequate survival and rescue facilities are provided. Most present-day aircraft are capable of withstanding ditching impact forces and remain afloat for a sufficient length of time to complete a successful evacuation. High-wing aircraft are possible exceptions to this conclusion. The addition of top hatches on such aircraft would provide a means of egress for occupants in the case of water landings. A successful evacuation is largely dependent on knowledgeable and well-trained crew members who can maintain authority and discipline before impact, during the evacuation from the ditched aircraft and while awaiting rescue facilities to arrive. Life rafts, life jackets and survival provisioning must be adequate to supply the needs of all occupants, be in good repair at all times, easily accessible in time of need and instructions for their use clearly and simply stated. On aircraft being operated on other than extended overwater flights, flotation equipment, at least to the extent of buoyant seat cushions, should be required.

27,454

Goldbaum, L.R. & Domanski, T.J. AEROSPACE TOXICOLOGY PROCEDURES: CURRENT PRACTICES AND TRENDS AT THE ARMED FORCES INSTITUTE OF PATHOLOGY. *Aerospace Med.*, July 1965, 36(7), 662-664. (US Armed Forces Institute of Pathology, Washington, D.C.).

Emergent findings pertaining to an altered approach to the analysis of biologic specimens for the presence of therapeutic concentrations of a number of the basic drugs commonly employed are presented. Direct ether extraction is applied to a relatively small amount of urine or solid tissue. Drug separation and purification are accomplished by simple, alkaline distillation. Drug identification and quantitative estimation are made by means of gas-liquid chromatography, ultraviolet spectrophotometry and chemical tests. The present comments are confined to qualitative aspects of these studies.

27,455

Barron, C.I., Schwichtenberg, A.H. & Secrest, R.R. MEDICAL EVALUATION OF AIRMEN EXPOSED TO ALTITUDES IN EXCESS OF 50,000 FEET. *Aerospace Med.*, July 1965, 36(7), 665-668. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

With the advent of the supersonic commercial transport concern has been expressed at the possible biological effects to crew and passengers of ionizing radiations, ozone, decompression, thermal extremes, accelerations and rapid time-zone changes. During the past 10 yrs. military and civilian pilots have been exposed to environmental conditions existing at contemplated supersonic transport flight altitudes for total periods of 250 to 2,000 hrs. These pilots have undergone extensive medical examinations and in this study the results of the examinations are compared to those obtained from pilots with no exposure above 50,000 ft. The examinations were especially designed to assess the effects of high altitude radiation and included extensive ophthalmological, neurological, hematological and genetic studies, as well as background radiation determinations. In not a single case in the exposed group could a physical defect be causally related to high altitude radiation. The findings indicate man's ability to safely tolerate the environmental stresses existing in the high altitudes. Based upon this study there is every reason to expect that the knowledge gained in design reliability and safety can be successfully applied to the supersonic transport making high altitude, high speed flight as safe and as routine as current jet operations.

R 6

27,456

Kiel, F.W. HELICOPTER ROTOR-BLADE INJURIES. *Aerospace Med.*, July 1965, 36(7), 668-670. (US Armed Forces Institute of Pathology, Washington, D.C.).

In helicopter accidents 6% of those killed are bystanders struck by a rotor blade. The files of the United States Army Board for Aviation Accident Research, the U.S. Naval Aviation Air Safety Center, the Office of the Deputy Inspector General of the Air Force and the Civil Aeronautics Board contain reports on 17 deaths from rotor-blade injuries. Civilian helicopters were involved in half of the 17 fatal cases, typically the small utility helicopter with a main overhead rotor and a smaller antitorque rotor on the tail. In the earlier years spectators were the usual victims but ground crewmen and disembarking passengers are the persons being struck more commonly nowadays. In 10 instances it has been the small antitorque rotor that was the wounding agent, while in 5 cases a main rotor has been involved. Continued vigilance by ground crewmen, repeated warnings to passengers and competent supervision of spectators must be maintained in order to eliminate this completely preventable type of death.

R 2

27,457

Bauer, R.O., Campbell, M., Goodman, R., Munsati, T.L., et al. AEROEMBOLISM TREATED BY HYPOTHERMIA: REPORT OF A CASE. *Aerospace Med.*, July 1965, 36(7), 671-675. (University of California School of Medicine, Los Angeles, Calif.).

A case is presented of aeroembolism following attempted abortion with profound neurologic symptoms. The patient was treated successfully with hypothermia. The salvage of patients with dysbarism or aeroembolism and neurocirculatory collapse may be accomplished in the absence of hyperbaric chambers by careful application of whole body hypothermia.

R 31

27,458

Martin, J.F. & Jones, G.M. THEORETICAL MAN-MACHINE INTERACTION WHICH MIGHT LEAD TO LOSS OF AIRCRAFT CONTROL. *Aerospace Med.*, Aug. 1965, 36(8), 713-716. (Unica Research Co., Ltd., Montreal, Quebec, Canada & Aeromedical Research Unit, McGill University, Montreal, Quebec, Canada).

A theoretical model of a pilot-aircraft interaction wherein the pilot relies entirely upon his sense of the relative gravity vector for orientation information is developed. It is shown that the illusory effects arising from motions could cause him to operate the aircraft controls in a diametrically opposite manner to what would be appropriate. This model may serve as a basis to account for otherwise unexplained losses of control in jet transport aircraft. A series of recommendations for further investigation is proposed.

R 6

27,459

Hale, H.B., Ellis, J.P. & Williams, E.W. ENDOCRINE AND METABOLIC CHANGES DURING A 12-HOUR SIMULATED FLIGHT. *Aerospace Med.*, Aug. 1965, 36(8), 717-719. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

48 young men were studied by means of serial urinary determinations while working in flight simulators for 12 hrs. The "flights" began at 0700 hrs and ended at 1900 hrs. Post-flight values obtained at 2100 hrs were compared with control values obtained at 2100 hrs on the day before the test. Creatinine excretion did not show statistically significant variation with time. All other urinary constituents were expressed as ratios with creatinine. Simulated flight induced statistically significant elevations in urine volume, urea, uric acid, phosphorus, sodium, the Na/K ratio, 17-hydroxycorticosteroids, epinephrine and norepinephrine. The NE/E ratio fell significantly.

R 17

27,460

Bancroft, R.W. & Dunn, J.E., II. EXPERIMENTAL ANIMAL DECOMPRESSIONS TO A NEAR VACUUM ENVIRONMENT. Aerospace Med., Aug. 1965, 36(8), 720-725. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

To estimate the times of consciousness, collapse and survival of animals exposed to near-vacuum environments 125 conscious dogs were rapidly decompressed in either 1 or 0.2 sec from 35,000 ft, while breathing O<sub>2</sub>, to a pressure less than 2 mm. Hg absolute. Groups of 6 dogs each were exposed to this low pressure for periods of time ranging from 5 to 180 sec, with and without prior denitrogenation, and then recompressed to 35,000 ft with O<sub>2</sub> in either 5 to 30 sec. The dogs collapsed within 9 to 10 sec after decompression, as determined from motion picture films. Simultaneously, the effects of anoxia, water vapor and other evolved gases were apparent, resulting in a generalized muscle spasticity, a few gasps, momentary convulsive seizures, apnea and gross swelling of the body and extremities. All dogs exposed for less than 120 sec survived, despite evidence of lung involvement. Respiration recommenced spontaneously either during recompression or at ground level, providing the heart was beating; otherwise, death was inevitable. The longer the exposure time the more prolonged was the time for recovery which usually ranged between a few minutes to a few hours, except for 1 dog which exhibited a severe postdecompression paralysis with gradual recovery over a period of several weeks. Exposures of 120 to 180 sec resulted in approximately 15% to more than 80% fatalities, respectively. Denitrogenated dogs tended to show a slightly better survival rate. As might be expected the shorter the exposure time and the faster the recompression rate with O<sub>2</sub> the better were the chances for eventful and prompt recovery.

R 10

27,461

Dunn, J.E., II, Bancroft, R.W., Haymaker, W. & Foft, J.W. EXPERIMENTAL ANIMAL DECOMPRESSIONS TO LESS THAN 2 MM. HG ABSOLUTE (PATHOLOGIC EFFECTS). Aerospace Med., Aug. 1965, 36(8), 725-732. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Pathologic examination of tissues of dogs rapidly decompressed to less than 2 mm. Hg absolute was performed. Of the 125 dogs decompressed, 92 were autopsied at 3 time intervals: within 30 min, 2 to 5 days and 1 to 3 weeks postdecompression. Gross examination of the tissues was done on all autopsied animals. Lung damage was graded 1+ to 4+ according to the amount of edema, emphysema, atelectasis, and/or hemorrhage present. Microscopic examination of the tissues was performed on selected dogs from the various groups. The most impressive finding was the absence of major pathologic damage, except in the lungs, unless the exposure time exceeded 120 sec. By varying time of decompression and time of exposure to less than 2 mm. Hg, it was possible to separate the pathologic effects of anoxia versus time of decompression. In all dogs the severity of lung damage increased with duration of the anoxic exposure. In groups with comparable exposure times, the dogs decompressed in 1 sec exhibited pulmonary congestion, edema and hemorrhage, while those decompressed in 0.2 sec showed predominantly more petechial hemorrhages, and emphysematous changes. Denitrogenation appeared to reduce the incidence and severity of the lung damage. Those animals autopsied at the latter postdecompression periods showed evidence of resolution of all lesions, especially in the lungs.

R 14

27,462

Lamb, L.E., Stevens, P.M. & Johnson, R.L. HYPOKINESIA SECONDARY TO CHAIR REST FROM 4 TO 10 DAYS. Aerospace Med., Aug. 1965, 36(8), 755-763. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The effects of inactivity during chair rest for periods of 4 days, 6 days, 8 days and 10 days were studied. Despite the presence of body weight and the dependent position of the lower extremities deconditioning occurred. The average decrease in total blood volume after 10 days was slightly greater than the average noted after 11 days of bed rest. The average plasma volume loss and the average decrease in red cell mass was similar to that observed after 11 days of bed rest. Orthostatic tolerance and exercise tolerance were progressively diminished with longer periods of chair rest. This study demonstrates that confinement resulting in muscular inactivity causes deconditioning even when normal gravitational factors cause body weight and increased hydrostatic pressure below the diaphragm. For this reason deconditioning during manned space flight may be markedly influenced by confinement with restricted body movement, independent of what influence weightlessness may have on its development.

R 3

27,463

Harbold, G.J., Tegt, R.P. & Standeven, J.W. PROBLEMS ASSOCIATED WITH MEASUREMENT OF ACOUSTIC TRANSIENTS. Aerospace Med., Aug. 1965, 36(8), 767-773. (USN Missile Center, Bio-Acoustics Div., Point Mugu, Calif.).

The literature dealing with measurements of gunfire, blast, shock-wave, over-pressure, etc., indicates conventional acceptance and use of laboratory quality microphones, tape recorders, level recorders, impact noise analyzers and similar equipment. Evaluation of these types of systems by this laboratory has indicated serious limitations in response to acoustic transients, i.e., peak intensities of impulse noise from small arms fire was found to be much greater than previously reported (24 db or 16 times the peak pressure); also, measured values were not in accord with theoretical values. In view of these limitations a study was initiated to investigate the possibility of a system for impulsive noise measurement with extended transient response which would afford accuracy and flexibility necessary for field studies of a variety of weapons. This study reports the progress from the effort to date. Limitations of conventional systems are discussed. Pictorial evidence is included to illustrate how an extended transient response can overcome limitations of earlier systems.

R 4

27,464

Harrington, T.J., Edwards, D.K., III & Wortz, E.C. METABOLIC RATES IN PRESSURIZED PRESSURE SUITS. Aerospace Med., Sept. 1965, 36(9), 825-830. (Aircraft Research Manufacturing Div., Garrett Corporation, Los Angeles, Calif.).

4 Ss wearing a full pressure space suit were tested in a high altitude chamber at sea level pressure and at simulated 34,000 ft. with a suit pressurized to 3.5 psig. The Ss were exercised on a treadmill, and their metabolic rates were measured and compared with the heat removal rates from the suit by ventilating oxygen gas at 15 cu. ft. per min. flow, 40°F dew-point temperature, and 70° and 80°F dry-bulb temperature. Avenues of heat loss other than by suit ventilation gas flow were minimized, so a heat balance was achieved between the Ss' metabolic heats, the heats removed by the ventilation system, heats stored by the Ss, and useful work ("efficiency") accomplished by the Ss. It was found that the gas flow was marginal for cooling at light work rates (at 180 kcal/m<sup>2</sup>/hr) and inadequate for heavier work, in which case the Ss apparently stored the excess heat. The metabolic rates observed with the pressurized suits were quite high, and represented approximately twice the rates observed in experimentation with unpressurized suits.

R 3



27,465

Streimer, I., Getzkin, A.J., & Wendrow, B. SYSTEM DESIGN COSTS AND CONSIDERATIONS AS A FUNCTION OF MAINTAINING SPACE CREW PHYSICAL FITNESS. Aerospace Med., Sept. 1965, 36(9), 830-833. (Space & Information Systems Div., North American Aviation, Inc., Downey, Calif.).

The engineering costs imposed by exercise programs upon space system design are detailed. The implications of their impact upon future systems are discussed and the possibilities of the utilization of pharmacological techniques alone or in conjunction with exercise programs as maintainers of space crew physical fitness are surveyed.

R 19

27,466

Eugster, J. INTERSTELLAR MATTER (WITH SPECIAL REFERENCE TO DARK CLOUDS). Aerospace Med., Sept. 1965, 36(9), 834-840. (University of Zurich, Zurich, Switzerland).

Current thought on the structure of dark clouds deserves special attention in that it is paving the way for extensive analyses of interstellar dust particles and more recently, for studies in space chemistry. Interstellar matter is generally defined as any material which is not clustered together to form stars but which exists as free gas or dust in interstellar space.

R 34

27,467

Dvorak, J., Andel, J., Horak, J., Krecek, J., et al. OBJECTIVE EVALUATION BY DIGITAL COMPUTERS OF THE HYPOXIC STRESS REACTIONS IN MAN AND OF THE METHODS USED. Aerospace Med., Sept. 1965, 36(9), 840-842. (Institute of Aviation Medicine, Prague, Czechoslovakia).

By a simple procedure the weights of the methods used in experiment are calculated as coefficients from a set of linear equations. It is possible to arrange different sets of methods, after computation of their deviations of the calculated from the ideal value. According to the decreasing deviation from the ideal value and the increasing probable error with the increasing number of methods, it is possible to point to the most suitable set of methods. In our case the best suitable number of methods seems to be about 4; the best set was formed by oximetry, heart rate, ventilation and respiratory rate recording.

R 3

27,468

Cooke, J.P. & Bancroft, R.W. NEUROLOGIC ADAPTATIONS AND AUDIOGENIC RESPONSES IN MICE EXPOSED TO A CHRONIC 2X GRAVITY FIELD. Aerospace Med., Sept. 1965, 36(9), 843-850. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

From the experimental data presented in this study, it is concluded that chronic 2g<sub>p</sub>-exposure of young mice for 10 or 11 days has resulted in adaptations that affect neurological responses in some animals. It is also concluded that these adaptive changes are not necessarily detrimental to the organism. These conclusions are based upon both a reduction in the incidence and severity of audiogenic seizure following acceleration. It is suggested that the development of a more efficient circulatory system during acceleration may be associated with this seizure reduction. Other adaptations include alterations in the growth pattern, changes in the percentage ratio of organ/body weight and hemological alterations that are indicative of stress response. These findings do not rule out readaptations of the balance or hearing mechanism or physiological alterations that may result. Whether any like adaptations result in man during prolonged exposure to acceleration in space flight remains to be learned; the lack of an expected increase of seizure, and in fact an actual decrease in some animals is very encouraging. It is felt that this study gives positive evidence that indicates an ability of higher living organisms to tolerate and adjust to altered gravity fields, just so long as the intensity of acceleration is not great enough to cause immediate mechanical trauma and circulatory disorders of a major proportion.

R 55

27,469

Strumza, M.V. INFLUENCE BREATHING CARBON DIOXIDE UPON SOME ALTERATIONS INDUCED BY HYPOXIA. Aerospace Med., Sept. 1965, 36(9), 850-854. (Laboratory of Aviation Medicine, Medicine Faculte, Paris, France).

Studies were performed on 114 young healthy volunteers in 2 parallel trials, to ascertain the correction of the alterations induced by mild hypoxia on the psychologic and psychomotor performances, by addition of carbon dioxide to the artificial atmosphere. The new data corroborate our previous observations and allow an estimate of the limits of correction possibilities. The intellectual efficiency tests and the estimate of the metabolic cost of a task show that: a) The correction of the alterations bound to mild hypoxia,  $PIO_2$  115 &  $PIO_2$  110 mm. Hg, seems to be better with  $PICO_2$  15 mm. Hg than with  $PICO_2$  7 mm. Hg; b) The alterations resulting from inhalation of gas mixtures with lower  $PO_2$ , 100 mm. Hg, is better corrected with  $PCO_2$  9 mm. Hg than with  $PCO_2$  15 mm. Hg. At the lower concentration of  $CO_2$ , the Ss were disturbed and hyperventilation was seen. These conclusions are valid for experiments of 2 hr. duration.

R 7

27,470

Barry, W. & Jones, G.M. INFLUENCE OF EYE LID MOVEMENT UPON ELECTRO-OCULOGRAPHIC RECORDING OF VERTICAL EYE MOVEMENTS. Aerospace Med., Sept. 1965, 36(9), 855-858. (Defense Research Board, Toronto, Ontario, Canada & Physiology Dept., McGill University, Montreal, Quebec, Canada).

The cause of an EOG artifact noted during vertical saccadic eye movements has been investigated. Records of eye movements were simultaneously obtained from D.C. electro-oculography and a movie photographic method in response to intermittent vertical saccadic changes in visual fixation. The artifact was found to run the same time course as the upper eye lid movement and is probably directly attributable to this. An argument is advanced suggesting that changes in the relative position of the eyelid and eyeball are responsible for the artifact and a simplified model of the electrical set-up by which the eye ball, lids and electrodes might function is presented.

R 3

27,471

Felig, P. OBSERVATIONS ON RATS EXPOSED TO A SPACE CABIN ATMOSPHERE FOR TWO WEEKS. Aerospace Med., Sept. 1965, 36(9), 858-863. (USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio).

The effects of breathing 98% O<sub>2</sub> at 258 mm. Hg were studied in male albino rats maintained for 2 weeks in a closed system environmental chamber. 3 separate experiments were conducted, in each of which temperature, humidity and CO<sub>2</sub> concentration were carefully regulated. Control animals were maintained in identical cages in room air. All but one of the 140 rats exposed to O<sub>2</sub> survived for a mortality rate of less than 1% and a total exposure time of 1960 rat-days. No significant differences as compared to controls were noted in growth rates or in pulmonary, hepatic, renal and thyroid function. A very modest reduction in hematocrit observed in each experiment may be attributable to a mild suppression of erythropoiesis.

R 28

27,472

Burner, A.M., Benson, R.E. & Thomas, R.G. USAF WHOLE BODY GAMMA SPECTROMETRY. Aerospace Med., Sept. 1965, 36(9), 864-868. (USAF Radiological Health Lab., Wright-Patterson AFB, Ohio).

Gamma spectrometry has become an important adjunct in support of routine and emergent assessment of radioactivity in biological and environmental specimens. It has proved to be particularly useful in direct identification of known and unknown radionuclides present in the body and in the assessment of the level of activities present. In accord with the increasing demand for an Air Force capability to conduct direct measurements of total body radioactivity in Air Force personnel, a whole body gamma spectrometry facility has been established in the USAF Radiological Health Laboratory (AFLC), at Wright-Patterson AFB, Ohio. The design and initial operation of this facility are described. In particular, experience concerning background activity, which has been observed to vary by as much as 40% during an 8-hr. period, is discussed. Such variations pose a serious problem for accurate calibration and measurement of in vivo radioactivity. Studies undertaken to identify the sources of the variation in background activity and actions taken to limit the magnitude of the variation are reported. Techniques employed for calibration of the whole body counter are emphasized. Studies involving human Ss and phantoms to demonstrate the influence of factors such as body size and changing distribution of nuclides within the body upon in vivo counting efficiency are described. The importance and application of whole body gamma spectrometry in support of the Air Force aerospace mission are discussed.

R 4

27,473

Conkle, J.P., Register, J.W. & Worth, G.L. MULTI-STAGE CRYOGENIC TRAPPING SYSTEM. Aerospace Med., Sept. 1965, 36(9), 869-874. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

A portable, easily operated, multi-stage cryogenic trapping system contained in a box 86 x 66 x 61 cm has been developed. Liquid nitrogen, gaseous nitrogen, ice, dry ice and 110 volt 60 cycle power required for operation of the system are available to most military installations. Ice formation in the -78°C trapping cylinder entrance tube and liquid O<sub>2</sub> formation in the -175°C trapping cylinder were eliminated in the design of the system. Catalytic conversion of trapped materials was minimized by use of stainless steel and Teflon. Operation of the system was simplified by inclusion of a liquid nitrogen level-controller. Partial separation of compounds was accomplished by operating the trapping cylinders of the system at 3 different temperatures. Several compounds are listed according to the temperature at which they are expected to be concentrated in significant quantities. The system is efficient for concentration of micro and macro contaminants in an atmosphere. The concentration of a contaminant in a sample area may be estimated from the total trapping time, the flow through the system during trapping and the concentration of the contaminant in the trapping cylinders.

R 5

27,474

Wilson, C.L. SOVIET HIGH ALTITUDE PRESSURE SUIT DEVELOPMENT, 1934-1955. Aerospace Med., Sept. 1965, 36(9), 874-877. (USAF Bioastronautics Office, Andrews AFB, Washington, D.C.).

From 1934 to 1943 and 1946 to 1955 the USSR had an excellent high altitude pressure suit program. The effort was staffed with excellent quality technical personnel and adequate support facilities were used. From 1934 to 1940 the Soviet program at least equaled and probably exceeded in scope and excellence the combined efforts of all other nations in this technical area. Soviet aerospace life scientists in general have been serious and vigorous in their efforts to protect their aircrew members. The weaknesses of their program for portions of that period include the following: lack of appreciation of benefits of denitrogenation; quick don of portions of the pressure suit after the rapid decompression event; early lack of appreciation of benefits of pressure breathing; lack of accurate formulae to estimate alveolar gas tensions; no original work on bladder and capstan suits; reliance on a closed circuit life support system.

R 11

27,475

Howard, J.L., Clark, W.B., Cuiver, J.F. & Tredici, T.J. CURRENT UNITED STATES AIR FORCE POLICY ON GLAUCOMA. Aerospace Med., Sept. 1965, 36(9), 878-880. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The current United States Air Force glaucoma policy has been in effect since January 1963. In the intervening 2 yrs., 43 people have been returned to flying duties on waiver for: a) Preglaucoma--Aircrew personnel with tensions of 22-29 mm. Hg, full visual fields, normal funduscopy, and capability for quarterly follow-up were permitted to continue their flying military mission without medication; b) Glaucoma--If the tension surmounted 29 mm. Hg, there was early evidence of visual field loss, or the optic disc appeared cupped, grounding was initiated. Therapy with a sympathomimetic amine was instituted. Waiver for return to flying was considered by the Office of the Surgeon General on the recommendation of the consultation centers at Brooks Air Force Base, Tachikawa Air Force Base, or Wiesbaden Air Force Base attesting to the physiologic normalcy of the eyes. Flying with such medication was then permitted. The United States Air Force glaucoma policy, with the division of patients into preglaucoma and glaucoma categories, appears to warrant continued study, for the nation has gained experienced personnel in 43 flying positions and accumulated over 5000 hrs. of additional flying protection without paying the price of visual field loss or a single aircraft accident. The projected increasing age of our flying population in the next several years will amplify the effects of this policy.

R 11

27,476

Finkelstein, S.; Tomashefski, J.F. & Shillito, F.H. PULMONARY MECHANICS AT ALTITUDE IN NORMAL AND OBSTRUCTIVE LUNG DISEASE PATIENTS. Aerospace Med., Sept. 1965, 36(9), 880-884. (Aviation Medicine Research Lab., Ohio State University College of Medicine, Columbus, Ohio).

To determine the effects of acute exposure to hypobaric 100% O<sub>2</sub> upon mechanics of ventilation in both normal Ss and in patients with obstructive lung disease, 2 sets of experiments were designed. Normals were exposed to altitude equivalents of ground level, 18,000 ft. and 33,700 ft. in an altitude chamber. Similarly, patients were exposed to altitude equivalents of ground level and 18,000 ft. With the single exception of 1 asthmatic patient, vital capacity decreased under hypobaric conditions in both groups. All of the remaining tests which were high flow dependent improved without exception upon exposure to altitude. In addition to the objective improvement which was found to be statistically significant, a subjective sensation of decreased effort of breathing at altitude in comparison with ground level was experienced by all the Ss, both normals and patients.

R 9

27,477

Liske, E. "H-RESPONSE" IN THE ELECTROENCEPHALOGRAMS OF AIRCREW PERSONNEL. Aerospace Med., Sept. 1965, 36(9), 884-887. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Most clinical reports on the subject agree that the EEG in migraine patients reveal dysrhythmic trends to a greater degree than in normal controls; however, the EEG findings have little specificity. Recently frequency analysis of the EEGs of migraine patients has revealed a much stronger photic response at the higher stimulation rates. When this response is graphed a curve emphasizing the high-frequency response is obtained. This curve has been called the H-response. The present study explores the possibility of determining an "H-response" by simple visual assessment of the EEG without the inconvenience and expense of using a frequency analyzer. The 12 "H-responses" that were obtained from 553 patients are correlated with the clinical findings, with special attention to those with migraine. It is concluded that those "H-responses" which are determined by visual methods cannot be correlated with migraine.

R 13

27,478

Stahl, W.M. RENAL HEMODYNAMICS: THE EFFECT OF GRAVITY ON SODIUM AND WATER EXCRETION. Aerospace Med., Oct. 1965, 36(10), 917-922. (Surgery Dept., University of Vermont College of Medicine, Burlington, Vt.).

Measurement of general and renal hemodynamic factors, and water and electrolyte excretion, was carried out in a series of dogs subjects to change from supine to the erect position and immersion in water. These studies indicate changes in renal blood flow and tissue tension related to alterations in cardiac output produced by the experimental procedures. Alteration of solute and water excretion on the one hand and changes in function of the renin-angiotensin-aldosterone system on the other seem to be related to changes in renal tissue tension. The findings of decreased circulating volume and decrease in vasomotor reactivity following periods of bedrest, water immersion or weightlessness appear to be the result of the activity of normal mechanisms for regulating volume and tension which respond to changes in cardiac output and renal vascular resistance. It is suggested that the partial effectiveness of exercise and intermittent venous occlusion in ameliorating these changes is related to the effects of these maneuvers on cardiac output and renal vascular resistance.

R 42

27,479

Taliaferro, Ellen H., Wempen, R.R. & White, W.J. THE EFFECTS OF MINIMAL DEHYDRATION UPON HUMAN TOLERANCE TO POSITIVE ACCELERATION. Aerospace Med., Oct. 1965, 36(10), 922-926. (Advance Biotechnology Dept., Douglas Aircraft Company, Inc., Santa Monica, Calif.).

A decrease in tolerance to positive acceleration amounting to 15% to 18% has been shown to occur as a result of minimal dehydration produced by heat stress. The effects of heat stress alone did not produce any decrease in tolerance. Several mechanisms which may have produced this effect were discussed in the paper and recommendations for future work were stated.

R 7

27,480

Berkshire, J.R. COMPARATIVE PHYSICAL PERFORMANCES OF NAVAL AVIATOR TRAINEES FROM VARIOUS PROCUREMENT SOURCES. Aerospace Med., Oct. 1965, 36(10), 927-928. (USN School of Aviation Medicine, Pensacola Air Station, Fla.).

The Physical Training Department of the U.S. Naval School, Pre-Flight, administers a battery of physical ability tests at the beginning and at the end of pre-flight school training. The scores from 2 of these tests were analyzed for separate samples of students from 1963 and 1964. It was found that there were fairly consistent differences in the physical abilities of men coming from different procurement sources and that these differences persisted despite training. Also it was found that a 2 week shorter training syllabus, which concentrated on conditioning exercises to the exclusion of physical skills training (such as gymnastics and trampoline) resulted in as much or more improvement in test performance than did the longer mixed syllabus of 1963.

27,481

Curran, P.M. & Wherry, R.J., Jr. MEASURE OF SUSCEPTIBILITY TO PSYCHOLOGICAL STRESS. Aerospace Med., Oct. 1965, 36(10), 929-933. (USN School of Aviation Medicine, Pensacola Air Station, Fla.).

Wherry's model of psychological stress postulates a number of determiners of anticipatory physical threat stress (APTS), emphasizing the necessity for being able to actively control Ss' perceptions of threatening events. The purpose of the study was to determine if Es can actively manipulate environmental cues in order to control Ss' perceptions of such determiners of APTS as the perceived probability of unpleasant events (P'), the perceived proximity of unpleasant events (X'), and the perceived degree of unpleasantness of possible events (U'). 64 naval and marine cadet pilot trainees served as experimental Ss. 24 control Ss were selected from the same population. A 4-choice, color discrimination task was employed. Instructions for experimental and control Ss structured the situation as involving information processing in a simulated aircraft mission emergency. A "S's panel" and a "probability generator" were used to show levels of P' and U'. X' was also displayed on the panel. The threatening event was the possible occurrence of electrical shock. 3 5-min test sessions or "missions" were given each S. The findings were that systematic changes in environmental cues resulted in significant performance changes for the Ss. The hypothesized effects of P', X', and U' were substantiated. These findings tend to confirm Wherry's model for Anticipatory Physical Threat stress.

R 1

27,482

Snyder, R.G. HUMAN TOLERANCE LIMITS IN WATER IMPACT. Aerospace Med., Oct. 1965, 36(10), 940-947. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

The wide but overlapping range presented between human levels of clinical impact trauma, as measured in the laboratory on volunteer Ss, and the extreme limits of survival which may occur in free-fall, has long presented a scientific enigma. This study has been an attempt to identify and evaluate factors critical to protection and survival in human water impact. Theoretical mathematical bases for impact loadings on the body were noted, along with discussion of stunt jumper techniques. 50 (39 males, 11 females) cases of free-falls survived by individuals aged 7 to 80 years impacting water environments at over 55 ft/sec during the past 3 years were intensely investigated and analyzed. These represented over 25% of the 281 known water free-falls survived during this period. In addition, autopsy data in fatal falls occurring under similar environmental conditions during this time was compared. It was found that fatal cases sometimes presented a problem as to whether death was caused by drowning, and if so, whether the impact trauma could have been survivable. The most survivable body orientation, by a factor of 5-7 times, was found to be a (+G<sub>z</sub>) feet-first deceleration, in which critical velocity for human survival was slightly over 100 ft/sec. (116 ft/sec max.). In fatal cases a high proportion of rib fractures in lateral and transverse impact orientations was found to cause fatal penetration of the lungs and other internal organs. Patterns of injury and relationships of factors found to influence human survival tolerances are presented and compared with impact trauma on non-water surfaces.

R 25

27,483

Dougherty, J.D., Trites, D.K. & Dille, J.R. SELF-REPORTED STRESS-RELATED SYMPTOMS AMONG AIR TRAFFIC CONTROL SPECIALISTS (ATCS) AND NON-ATCS PERSONNEL. Aerospace Med., Oct. 1965, 36(10), 956-906. (US Federal Aviation Agency, Fort Worth, Tex.).

The impact of air traffic control work on the health of Air Traffic Control Specialists (ATCS) has been of concern to the Federal Aviation Agency (FAA) for some years. Those who are engaged in the occupation, as well as external observers, have expressed the belief that the stress inherent in the occupation has an adverse effect on ATCS. Unfortunately, there is little objective evidence on which an evaluation of this belief can be based. The present investigation represents an attempt to evaluate the impact of the ATCS work on the health of those engaged in it. As part of an employee health program conducted in the southwestern states by the senior author, information about specific health problems was solicited on an anonymous basis from participants in the program. The data collected permitted comparison of ATCS personnel with personnel not engaged in ATCS work. It was felt that if the ATCS occupation was indeed stressful, then the comparisons of health information from the 2 groups should indicate a higher incidence of health problems among the ATCS. The ATCS reported significantly more headaches, indigestion, chest pain and ulcers than did non-ATCS. In every reported symptom area, the percentage reported was higher for ATCS. New symptoms for headaches, indigestion, chest pain and ulcers were reported with a significantly higher incidence in ATCS. Considering length of service, the ATCS and non-ATCS showed no significant difference for total incidence of symptoms until after 3 years service. After 3 years service, the ATCS reported a significantly higher incidence of symptoms, the difference increasing in significance with continued service. Considering age, the ATCS showed a significantly higher total incidence of symptoms, the difference increasing in significance with age. Considering GS grade, below GS 10, there was no difference between ATCS and non-ATCS, but, at GS 10 to 12 and > 13 the ATCS reported significantly more symptoms with the peak at GS 11 and 12 level.

R 2

27,484

Wing, J.F. UPPER THERMAL TOLERANCE LIMITS FOR UNIMPAIRED MENTAL PERFORMANCE. Aerospace Med., Oct. 1965, 36(10), 960-964. (USAF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio).

14 experiments done in various laboratories have assessed the effects of high thermal stress on mental performance. These experiments represent different combinations of exposure time and effective temperature. When the results of these studies are reviewed, they indicate that the upper thermal limit for unimpaired mental performance varies systematically with exposure duration. Specifically, the lowest test temperatures yielding statistically-reliable decrements in mental performance decline exponentially as exposure durations are increased up to 4 hrs. When this temperature-duration curve for mental performance is compared with physiological tolerance curves, it is found to lie well below them at every point in time.

R 16

27,485

Chubb, R.M., Detrick, W.R. & Shannon, R.H. COMPRESSION FRACTURES OF THE SPINE DURING USAF EJECTIONS. Aerospace Med., Oct. 1965, 36(10), 968-972. (USAF Life Sciences Div., Norton AFB, Calif.).

A study of 629 USAF ejections shows that the position of the body at the time of ejection is the most significant factor contributing to compression fractures due to ejection forces. There is little risk of fracture if the spine is straight and the head and hips are firmly against the seat. Increasing age, lack of training in an ejection tower, ejection from bombers rather than fighter or trainers, and use of the M-3 ballistic catapult or a rocket catapult instead of the M-5 ballistic catapult are all factors that may increase the risk of compression fracture. The available data suggested that all of the above were factors, but the small number of cases (28 compression fractures) was insufficient to prove this. There was no apparent effect of reported height, weight, or cushions. The effect of unauthorized and unreported cushions could not be determined. Other factors possibly contributing to fractures in rare instances were: negative G forces; failure to have the survival kit firmly in the seat pan; ejection through the canopy, probably accompanied by an unconscious ducking movement; and holding the arms stiffly extended forward as a D-ring is pulled.

R 3

27,486

Murray, R.H., Prine, J. & Menninger, R.P. REPEATED, PROLONGED, LOW-INTENSITY +G. EXPOSURES. ANATOMICAL STUDIES IN DOGS. Aerospace Med., Oct. 1965, 36(10), 972-976. (Cardiopulmonary Lab., Indiana University, Bloomington, Ind.).

10 carefully selected dogs, anesthetized with small intravenous doses of pentobarbital and chlorpromazine, were studied. 4 dogs were selected as controls and the remaining 6 dogs were exposed twice weekly on a 4-foot radius centrifuge for one-hour periods to +2.2 G<sub>z</sub> (positive G) at the level of the xyphoid; centrifugation was carried on for 15 weeks for a total of 30 exposures. 4 of the centrifuged dogs died, each during centrifugation (during the second, seventh, tenth and twentieth hours). At autopsy only moderate congestion in the caudal lung segments and viscera was found. The 2 dogs that finished the planned program, and the 4 control dogs were essentially normal at autopsy. Previous studies in unanesthetized animals demonstrated that similar but more frequent exposures over a period of weeks caused significant renal lesions. It seems likely that these renal changes are due to the cumulative effects of frequently repeated tissue injury; they were not seen in the present study, probably because the interval between centrifugations was 3-4 days, permitting each tissue insult to subside before re-injury. The high mortality rate in this study is not understood at present, but it seems likely that the anesthesia restricted cardiovascular compensatory efforts.

R 21

27,487

Jones, G.H. VESTIBULO-OCULAR DISORGANIZATION IN THE AERODYNAMIC SPIN. Aerospace Med., Oct. 1965, 36(10), 976-983. (RAF Institute of Aviation Medicine, MRC, Farnborough, England).

On theoretical grounds it is to be expected that disturbance of vestibular and visual perceptual mechanisms could contribute substantially to the difficulties of recovery from an aerodynamic spin. To investigate this possibility experiments were performed in which simultaneous measurements were made of aircraft and compensatory eye angular velocities in the 3 planes of yaw, roll and pitch, using a movie-oculographic method for recording eye movements. The results showed that in the roll plane of the skull there is apparently very limited capability for optokinetic following. Consequently the misleading vestibular signals which arise from continued rotation, drive an inappropriate oculomotor response which goes on virtually unchallenged by visual fixation, in this plane. Failure to fixate can even occur in the yaw plane when the discrepancy between vestibular and optokinetic drives to the oculomotor system becomes sufficiently large. The practical implications of these and other features are discussed in the context of erect and inverted spin configurations. The following specific recommendations are made: a) Multiple-turn spins lasting in excess of 5-10 sec are inadvisable in the early stages of training; b) Even experienced pilots should approach multiple-turn spinning in stages; c) When embarking on a test spinning program director-type indication of what to do for recovery at any stage in the spin, whether erect or inverted, should be installed in addition to such obvious measures as audio altitude warning and anti-spin tail parachute; d) The physiological effects attributable to rotational stimulation in the roll plane of the skull can be minimized by keeping the head and eyes directed towards the horizon at all times whether the spin be erect or inverted. The experimental results as a whole suggest that at times the man-machine combination may lead to insurmountable difficulties in recovery from the spin and the conclusion is drawn that in the final event the correct approach should be to design out the possibility of its occurrence.

R 15

27,488

Zirkle, L.G., Mengel, C.E., Horton, Betty D. & Duffy, E.J. STUDIES OF OXYGEN TOXICITY IN THE CENTRAL NERVOUS SYSTEM. Aerospace Med., Nov. 1965, 36(11), 1027-1032. (Medicine Dept., Duke University Medical Center, Durham, N.C.).

Mice of varying tocopherol status were exposed to oxygen under high pressure. Clinical features of oxygen toxicity in the central nervous system (seizures and death) correlated with lipid peroxidation of brain tissue which was associated with inhibition of brain acetylcholinesterase activity. Clinical and biochemical effects of hyperoxia were exaggerated in tocopherol deficient mice and were prevented by prior supplementation with tocopherol, a specific inhibitor of lipid peroxidation. It is postulated that the primary effect of hyperoxia on the central nervous system is peroxidation of brain lipid which directly or indirectly (through interference with other metabolic systems) results in cell and tissue damage.

R 46

27,489

Butcher, B.A., Eastis, J.F. & Clark, D.A. METHOD FOR DETERMINATION OF CALCIUM IN SERUM, PAROTID FLUID AND URINE IN THE WEIGHTLESS STATE. Aerospace Med., Nov. 1965, 36(11), 1032-1035. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Since the Manned Orbiting Laboratory program includes on-board monitoring of calcium metabolism, a method suitable for this determination under conditions of weightlessness has been investigated. Most techniques for calcium assay that are used at the present time have certain disadvantages that would preclude their use under conditions of weightlessness; whereas the nuclear fast red (NFR) technique of Baar, as modified by Kingsley and Robnett, is simple, and all steps in the procedure are compatible with performance in the weightless state. The possible interference of magnesium, hemolysis, and protein was investigated. These effects should be minimal unless drastic changes in magnesium and/or protein levels should occur. The interference by hemolysis may be obviated by the use of a proper blank. The method has been adapted to an apparatus to effect mixing in the weightless state and is regarded as a practicable first-generation method for monitoring calcium metabolism.

R 9

27,490

Mengel, C.E., Zirkle, L.G., O'Malley, B.W. & Horton, Betty D. STUDIES OF THE MECHANISM OF IN VIVO RBC DAMAGE BY OXYGEN. Aerospace Med., Nov. 1965, 36(11), 1036-1041. (Medicine Dept., Duke University Medical Center, Durham, N.C.).

Erythrocytes of dogs exposed to oxygen under high pressure showed initiation of in vivo peroxidation of erythrocyte lipid, increased osmotic fragility and decreased acetylcholinesterase activity. There were no gross evidences of hemolysis although additional studies indicated that a small population of red cells had been lost during in vivo OHP. No changes of the usual oxido-reduction transformation systems were noted. In vitro studies showed that acetylcholinesterase was not inhibited by oxygen per se (at normal or increased pressures) but was inhibited by addition of preformed lipid peroxides. These studies suggest a role of acetylcholinesterase inhibition in the damage to red cells by hyperoxia, and demonstrate that this enzyme can be inhibited by lipid peroxides in vitro and probably in vivo.

R 47

27,491

Wortz, E.C., McTee, A.C., Swartz, W.F., Rheinlander, T.W., et al. EFFECTS OF CONTROL-DISPLAY DISPLACEMENT FUNCTIONS ON PURSUIT AND COMPENSATORY TRACKING. *Aerospace Med.*, Nov. 1965, 36(11), 1042-1047. (Air Research Manufacturing Div., Garrett Corporation, Los Angeles, Calif.).

An experiment was conducted to determine optimal control-display relationships in a generalized tracking task. This report contains a description of the experimental conditions, procedures and results of the experiment. Conclusions are drawn about the preferred type of display, control-display displacement function, temporal lag between operator input and feedback, and target display velocities. The conclusions are applicable to piloting and radar tracking operations.

R 5

27,492

Allen, G.R., Maslen, K.R. & Rowlands, G.F. SOME ASPECTS OF THE DYNAMIC BEHAVIOUR OF AIRCREW BREATHING EQUIPMENT. *Aerospace Med.*, Nov. 1965, 36(11), 1047-1053. (Human Engineering Div., Royal Aircraft Establishment, Farnborough, Hants, England).

Techniques necessary for accurate measurement of dynamic pressure and flow are first described. The need for cyclic flow testing for regulator response is demonstrated from basic bioengineering considerations, and the British test is outlined. The usefulness of breathing simulators is discussed and an electronically-controlled machine developed at R.A.E. described. British problems on instability in breathing equipment, and the nature and cause of the phenomenon, are discussed. Instability is shown to be a function of the complete system, in which the impedance of the human respiratory system can play an important part. A technique for measuring this impedance is described, preliminary results are presented, and pneumatic analogues to simulate impedance considered. Preliminary work is reported on subjective perception of pressure oscillations. Brief comment is made on improvement of system dynamic behavior.

R 24

27,493

Hanson, P.G., Johnson, R.E. & Engel, G. PLASMA FREE FATTY ACID CHANGES IN MAN DURING ACUTE COLD EXPOSURE AND NICOTINIC ACID INGESTION. *Aerospace Med.*, Nov. 1965, 36(11), 1054-1058. (Human Environmental Research Lab., University of Illinois, Urbana, Ill.).

We have shown previously that acute cold exposure produces a significant increase in plasma free fatty acids (FFA) in human Ss. Several investigators have demonstrated that orally ingested nicotinic acid suppresses plasma FFA concentration in fasting humans. Our present research was designed to observe the effect of acute cold exposure on plasma FFA after oral ingestion of nicotinic acid. 4 healthy male Ss (21-25 yrs) were studied in paired cold exposure and control periods for a total of 20 experiments during June and July, 1964. The conditions of cold exposure were: semi-nude for 100 min at 2°C, followed by 240 min of recovery at 24°C, lightly clothed. Control periods covered an equal time span at 24°C. All experiments were conducted in a fasted state with water ad lib. Nicotinic acid (200 mg per os) was taken 10 min prior to the beginning of the periods for which it was scheduled. In addition to plasma FFA, the following measurements were made: plasma glucose, plasma total ketones, urinary vanilmandelic acid and respiratory metabolism. Our data show that nicotinic acid strongly suppresses ( $P < .01$ ) plasma FFA concentration during acute cold exposure while fasting. This action significantly reduces the availability of FFA as a metabolic substrate at a time of increased requirement for energy metabolism. There is a suggestion that gross oxygen consumption is concomitantly reduced during cold exposure periods following nicotinic acid ingestion.

R 18

27,494

Michaelson, S.M., Thomson, R.A.E. & Howland, J.W. COMPARATIVE STUDIES ON 1285 AND 2800 MC/SEC PULSED MICROWAVES. *Aerospace Med.*, Nov. 1965, 36(11), 1059-1064. (Radiation Biology Dept., University of Rochester School of Medicine & Dentistry, Rochester, N.Y.).

Response of dogs exposed to 2800 Mc/sec and 1285 Mc/sec microwaves reveals a direct correlation between field intensity and body weight loss which is similar at both frequencies, at comparable field intensities. The degree and onset of leukocyte and erythrocyte increases and/or decreases, is dependent on microwave frequency, field intensity and duration of exposure. Reticulocytosis during daily 20 mW/cm<sup>2</sup>, 1285 Mc/sec exposures indicate an hematopoietic effect. Signs of distress are less evident at 1285 Mc/sec than at 2800 Mc/sec when critical rectal temperature level (106°F or greater) are reached, and suggest that potential microwave hazards may be obscure at the lower frequency.

R 18

27,495

Odland, L.T. & Michaelson, S.M. SOME OBSERVATIONS ON DOGS FOLLOWING LOWER BODY EXPOSURE TO 1000 KVP X-RAYS. *Aerospace Med.*, Nov. 1965, 36(11), 1064-1068. (University of Rochester, Rochester, N.Y.).

Studies with dogs given varying doses of 1000 KVP x-rays to the lower body indicated that the 60-day median lethal dose is about 920 R; the limiting factor being the sensitivity of intestinal mucosa cells rather than those of the hematopoietic system. The acute clinical phase of lower body radiation injury is much shorter than with whole or upper body exposures, suggesting the gut and/or other abdominal viscera have a rapid component of total body recovery potential as opposed to primarily hematopoietic damage where recovery is much prolonged. Anorexia, weight loss, vomiting and hypersialosis were the most significant clinical changes, and these appeared immediately post-exposure persisting for 5-10 days. Fractionation of the single doses into 4 equal components given during brief sessions over as many consecutive days, decreased morbidity and mortality. Erythropoiesis was relatively unimpaired by the exposure of only the lower body.

R 15

27,496

Miller, P.B., Johnson, R.L. & Lamb, L.E. EFFECTS OF MODERATE PHYSICAL EXERCISE DURING FOUR WEEKS OF BED REST ON CIRCULATORY FUNCTIONS IN MAN. *Aerospace Med.*, Nov. 1965, 36(11), 1077-1082. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

Various effects on circulatory functions of light to moderate physical exercise during 4 weeks of bed rest were studied in 6 healthy male volunteers. During exercise narrow cuffs inflated to 68 mm Hg were worn on the upper thighs. An identical schedule of tests was followed before and after bed rest. An average loss of 1212 ml in total blood volume occurred during 4 weeks of bed rest. An average decrease of 672 ml in plasma volume and 539 ml in red cell mass was observed. Changes in plasma volume during and after bed rest paralleled changes characteristic of simple bed rest. In contrast to simple bed rest, the major loss of red cell mass was noted at the end of bed rest and not during ambulation following bed rest. The M resting heart rate for all Ss increased 15 beats per min during bed rest. Syncope on the tilt table was more frequent and orthostatic heart rates were higher after bed rest than before. The degree of postural intolerance after the bed rest conditions of this study appeared as marked as that observed after absolute bed rest. As judged by the time required to reach a heart rate of 180 or greater and by maximal oxygen consumption, physical endurance on the treadmill was not maintained by the in-bed isotonic exercise program utilized in this study. On the basis of the heart rates and oxygen consumptions during the in-bed exercise, the circulatory system was not greatly stressed. These results do not preclude the possibility that other exercise programs would favorably influence the maintenance of orthostatic tolerance and physical work capacity during bed rest.

R 13

27,497

Newberry, P.D., Johnson, W.H. & Smiley, J.R. EFFECT OF HYPOXIC HYPOXIA ON NYSTAGMUS INDUCED BY ANGULAR ACCELERATION. *Aerospace Med.*, Nov. 1965, 36(11), 1090-1093. (RCAF Institute of Aviation Medicine, Toronto, Ontario, Canada).

4 Ss were exposed to a horizontal angular acceleration of approximately  $156^{\circ} \text{ sec}^{-2}$  for 1 sec, while breathing air at ground level, and then while breathing air at 20,000 ft. On a different day the angular acceleration was repeated while breathing 10% oxygen at ground level, and then while breathing air at ground level. Total slow phase angular deviation of the eye, maximum slow phase angular velocity and total duration of nystagmus were used as criteria of the magnitude of the nystagmic response. There was a M increase of 61% in the slow phase angular velocity of the nystagmus occurring while breathing 10% oxygen compared with breathing air at ground level. At 20,000 ft, however, there was a M increase of almost 100% in total angular deviation, maximum angular velocity and total duration of nystagmus compared to breathing either 10%  $O_2$  or air at ground level. This is attributed to the obvious anxiety displayed by the Ss at 20,000 ft. It is suggested that hypoxia and the associated hyperventilation cause a trivial increase in the nystagmus resulting from a horizontal angular acceleration without hypoxia but that apprehension may cause a profound increase in nystagmus.

R 13

27,498

Bennett, G. HUMAN FACTORS IN THE CONCORD S.S.T. *Aerospace Med.*, Nov. 1965, 36(11), 1094-1096. (Ministry of Aviation, London, England).

This paper is a progress report on the Human Factors investigations which have been taking place in the Anglo-French Concord programme. Concord is a narrow delta-winged aircraft 184 ft long, powered by 4 underslung engines of 35,000 lbs thrust. Of the problems raised by the high cruising altitude, pressurization failure is the most significant. Allowing 1 min reaction time, Concord can make an emergency descent to 40,000 ft in d 1/2 min, and to 15,000 ft in 9 min. The airworthiness requirement is that the cabin altitude shall not exceed 25,000 ft in the event of any probable combination of failures. Ozone concentration in the stratosphere increases with height up to about 90,000 ft, and there is considerable variation with latitude and season. Because of the paucity of information on the chronic toxicity of ozone, a limit of 0.1 ppm has been set for the cabin. By 1971 the work being done on the effects of solar flares should provide better knowledge of the probability of significant increases in corpuscular radiation dosage at cruising altitude, and of the descent necessary to give an adequate atmospheric "umbrella." The types of transparent materials used give considerable attenuation of U.V.L., but even if this was not so, no hazard to passengers or crew would exist. A double-wall structure with air-intercooling has been adopted to give adequate thermal insulation of the cabin walls, and tests have shown this to be very effective. Multiple small passenger windows have been incorporated to minimize the risk of disorientation. Crew scheduling is being studied to minimize the serious effects of disturbances or circadian rhythms. The attention given to safety standards includes: the strong structure, the use of heat resistant alloys, and the thermal insulation of the cabin, the crashworthiness of passenger seating and tie-down, delethalisation of structures in the passenger environment.

27,499

Trites, D.K., Miller, M.C. & Cobb, B.B. PROBLEMS IN AIR TRAFFIC MANAGEMENT. VII. JOB AND TRAINING PERFORMANCE OF AIR TRAFFIC CONTROL SPECIALISTS--MEASUREMENT, STRUCTURE, AND PREDICTION. *Aerospace Med.*, Dec. 1965, 36(12), 1131-1138. (US Office of Aviation Medicine, FAA, Washington, D.C.).

A statistical study of training and job performance measures of several hundred Air Traffic Control Specialists representing Enroute, Terminal, and Flight Service Station specialties revealed that training performance measures reflected: a) performance in the training laboratories; b) academic performance; and c) instructors' opinions. In the job performance area, supervisors seemed to be evaluating: a) overall performance of an ATCS; b) his interpersonal orientation; c) job orientation; d) job potential; e) job performance and f) emotional stability. By examining the predictability of the job performance measures by training performance, aptitude tests, previous job-relevant experience, and demographic characteristics, evidence was elicited that: a) the ATCS specialties differ in the characteristics required for job performance; b) Terminal supervisors more consistently evaluate their ATCS in comparison with Enroute supervisors; c) opinions of the ATCS training course instructors are the best predictors of subsequent job performance and e) aptitude tests, previous job-relevant experience, and age at entry into training are related to job performance but not at very high levels.

R 13

27,500  
Blivaiss, B.B., Litta-Modignani, R., Galansino, G. & Foa, P.P. ENDOCRINE AND METABOLIC RESPONSE OF DOGS TO WHOLE BODY VIBRATION. Aerospace Med., Dec. 1965, 36(12), 1138-1144. (Physiology Dept., Chicago Medical School, Chicago, Ill.).

To determine the endocrine and metabolic response of restrained dogs to whole body vibration, pentobarbital anesthetized and non-anesthetized dogs were vibrated horizontally. After vibration of anesthetized dogs at either 4 cps, 0.4 G for 30 min. or 2 hr., or at 10 cps, 2.3 G for 2 hr., there was an average increase of 4.08 mcg 17-hydroxycorticosteroids (17-OH-CS) per 100 ml plasma and a significant increase in blood epinephrine but not serotonin or norepinephrine. Shaking at 4 cps, 1.7 G for 30 min. produced less of a change in plasma 17-OH-CS than at 0.4 G. However, shaking at 4 cps for 6 hr. led to greater increase in plasma 17-OH-CS at 1.7 G than at 0.4 G. Non-anesthetized dogs shaken at 4 cps for 30 min. had a greater increase of plasma 17-OH-CS than similarly shaken anesthetized dogs, thus showing a greater sensitivity of kinesthetic receptors to vibratory stimuli. Possible mechanisms for alterations in endocrine function are discussed.

R 45

27,501  
Lamb, L.E. & Stevens, P.M. INFLUENCE OF LOWER BODY NEGATIVE PRESSURE ON THE LEVEL OF HYDRATION DURING BED REST. Aerospace Med., Dec. 1965, 36(12), 1145-1151. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

In 4 Ss bed rest was used to induce recumbency diuresis. This was manifested by a decrease in fluid balance, body weight, and plasma volume, accompanied with an increase in hematocrit. After the changes from bed rest had occurred, the use of Lower Body Negative Pressure over a 2-day period resulted in rehydration manifested by an increase in fluid balance, body weight, and plasma volume, accompanied with a decrease in hematocrit. The use of LBNP is an effective means to restore hydration after recumbency diuresis has occurred. This has important applications to manned space flight when it is desirable to maintain the level of hydration.

R 8

27,502  
Stevens, P.M. & Lynch, T.N. EFFECTS OF 9-ALPHAFLUOROHYDROCORTISONE ON DEHYDRATION DUE TO PROLONGED BED REST. Aerospace Med., Dec. 1965, 36(12), 1151-1156. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

The effects of 9-alphafluorohydrocortisone on the metabolic changes which occur during 6 days of bed rest were studied in 4 healthy Ss. During the first 24-hr. of bed rest a loss of weight and an increase in urinary water and sodium excretion was noted in all Ss. By the end of the sixth day of bed rest the hematocrit had increased while the plasma volume had decreased by a M of 560 cc. The experimental protocol was then repeated but 9-alphafluorohydrocortisone, 2 mg./day, was given during the last 2 days of bed rest. During this time, the weight increased, water and sodium retention occurred, the hematocrit decreased and the plasma volume showed a significant increase of 239 cc. by the end of the sixth day of bed rest. It is suggested that part of the orthostatic deconditioning described following prolonged bed rest is due to plasma volume loss and that treatment with 2 days of 9-alphafluorohydrocortisone is a simple and efficient way to replete plasma volume losses due to prolonged bed rest.

R 19

27,503  
Zeller, A.F. USAF AIRCRAFT ACCIDENTS INVOLVING TEN OR MORE FATALITIES. Aerospace Med., Dec. 1965, 36(12), 1156-1159. (USAF Sciences Div., Norton AFB, Calif.).

Disaster accidents, defined as those involving 10 or more fatalities, are not an inconsequential part of the total Air Force aircraft accident picture. Yet, despite their spectacular nature and the great amount of public interest which they arouse, they are not the major source of accident loss to the Air Force in material, money, or lives. Of the 14,166 accidents experienced during the period 1953 through 1962, 81 fell into the disaster category. These resulted in 1,641 fatalities. An additional 2,461 fatal accidents involved 5,989 casualties. Disaster accidents are notable for the number of instances in which the cause of the accident cannot be determined. When the cause is determined, the pattern is quite comparable to that for the less severe accidents, with error on the part of the pilot being most frequently assessed. As it is not possible to predict when a potentially insignificant occurrence may degenerate into a tragedy, there are no remedial measures unique to the prevention of disasters.

R 5

27,504  
Stolurow, L.M. (Princ. Investigator). A LISTING OF SOCRATES RESEARCH STUDIES FROM MARCH 1964 TO JUNE 1965. Contract Nonr 3985(04), Sept. 1965, 7pp. Training Research Lab., University of Illinois, Urbana, Ill. (AD 621169)

This report contains a brief summary of information, a listing of studies using SOCRATES, a historical summary of its development, a list of the Technical Reports issued between the date on which the contract was initiated (February 1, 1963) and October, 1965, and a list of Technical Notes. The general areas of these studies are pre-programmed self-instruction and self-programmed individualized education.

27,505  
Cooke, J.P. & Beard, Sarah E. VERBAL COMMUNICATION INTELLIGIBILITY IN OXYGEN-HELIUM, AND OTHER BREATHING MIXTURES, AT LOW ATMOSPHERIC PRESSURES. Aerospace Med., Dec. 1965, 36(12), 1167-1172. (USAF School of Aerospace Medicine, Brooks AFB, Tex.).

A total of 13 simulated flights with 25 Ss and 4 chamber operators were performed using some 8,300 numbers and words and 2,200 words in sentences to help evaluate communication intelligibility in O<sub>2</sub> at 5 and 3.5 psia, in O<sub>2</sub>-and-nitrogen at 7 psia, in O<sub>2</sub>-and-helium at 7 psia, and to compare these findings with those obtained in room air at ground level. 3-way communication was carried out between chamber Ss and ground level operators in room air. No statistically significant differences could be detected in test results when either words within sentences or random numbers were employed, but unrelated words resulted in statistically significant differences in some cases. The same order of magnitude or less of errors resulted in a reduced O<sub>2</sub>-and-helium environment as in an O<sub>2</sub> environment at the same O<sub>2</sub> partial pressure, thus indicating no new communication intelligibility problems are created by the addition of helium. Also, the effects due to tiring or lack of alertness create as many problems in room air as do the reduced pressures if Ss are alert. More errors result between Ss in test environments than between Ss and operators, in which case phone communication equipment is necessary. Most errors are of the rhyming type.



27,506  
Coler, C.R., McLaurin, W.A. & Young, D.R. EFFECTS OF ADRENALIN OR INSULIN ON THE PERFORMANCE OF WORKING AND RESTING SUBJECTS. Aerospace Med., Dec. 1965, 36(12), 1181-1186. (Ames Research Center, NASA, Moffett Field, Calif.).

The performance and physiological effects of adrenalin or insulin were studied in human Ss. After approximately 8 hr. of enforced work or rest, our group of 9 Ss received adrenalin. The Ss in each drug group participated in both a working condition and a resting condition on separate occasions. Short-term memory, choice reaction time, and steadiness tests were used to evaluate S performance. 10 preinjection and 7 postinjection sessions of performance testing were given. Postinjection performance decrements occurred on all 3 tests for all Ss, both working and resting, in the Insulin group. Fewer decrements occurred in the adrenalin group. For the insulin group, postinjection decrements were most frequent in the working condition. However, for the adrenalin group, postinjection decrements were most frequent in the resting condition. 3 hr. after injection, performance had not recovered to preinjection levels in the working condition of the insulin group, while recovery had occurred in all other conditions.

R 2

27,507  
Petrocelli, A.W. SURVEY OF SOVIET ACTIVITY IN THE USE OF ACTIVE CHEMICALS FOR SPACE CABIN AIR REVITALIZATION. Aerospace Med., Dec. 1965, 36(12), 1187-1191. (Electric Boat Div., General Dynamics Corporation, Groton, Conn.).

The Soviet manned space flights have relied on an active chemical for the maintenance of a habitable cabin atmosphere. The active chemical has not been specifically identified in the available Soviet published literature. However, reasonable detailed descriptions of the properties of the active chemical have been given and, on the basis of those descriptions, it is concluded that the material employed was an alkali metal superoxide. Soviet scientists have been active for many yrs. in the study of inorganic peroxides, superoxides, and ozonides as air revitalization materials. This activity is reviewed and the significance of current Soviet basic chemical studies to future chemical air revitalization systems is analyzed.

R 63

27,508  
McVean, D.E. & Rendon, L. BEHAVIOR OF SERUM LACTIC DEHYDROGENASE IN MEN EXPOSED TO BRIEF, INTENSE THERMAL IMPULSES. Aerospace Med., Dec. 1965, 36(12), 1192-1193. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Lactic dehydrogenase isozyme patterns in serum obtained from human Ss exposed to brief, intense thermal impulses were determined by electrophoresis on acrylamide gel. Total lactic dehydrogenase activity of the serum was also determined using a standard clinical metal. No change was observed in either the serum lactic dehydrogenase isozyme pattern or in the total lactic dehydrogenase activity.

R 1

27,509  
Bazykin, V. RADIATION HAZARDS IN OUTER SPACE. Aerospace Med., Dec. 1965, 36(12), 1194-1195. (USSR Academy of Sciences, Moscow, Russia).

The main sources of cosmic radiation are considered in terms of their hazards to manned space flight. Primary cosmic radiation, a relatively stable source, contains high energy particles from which it is not possible to fully protect; however, the spaceship walls provide protection such that the average daily dose is approximately .002 the human tolerance dose. The radiation belts are somewhat greater hazards; these can be screened off by rather slight protective shielding; unfortunately the hazards have not yet been sufficiently studied thus the calculations of protection against the outer belt electrons remain conjectural. The third and most dangerous source are the solar chromospheric eruptions which are difficult to forecast and impossible to protect against at present, as the dosage inside the ship would rise to hundreds of rads if protection is 2 gms/cm<sup>2</sup>, far beyond the danger level. The radiation conditions of several of the satellite space ship flights are tabulated relative to cosmonaut dosage. (HEIAS)

27,510  
Finlay, J.R. DIAGNOSTIC CRITERIA FOR GLAUCOMA AND THE PILOT. Aerospace Med., Dec. 1965, 36(12), 1196-1199. (Greenwich, Conn.).

The FAA examination does not detect early glaucoma--only blindness due to glaucoma. Statistics suggest a significant amount of undetected glaucoma in pilots. Glaucoma should not be disqualifying. The standards regarding glaucoma should be made more realistic to reject only those patients who present hazard of sudden incapacitation or functional disability during their period of licensure. To detect glaucoma and prevent blindness, instrument tonometry should be a requisite part of the FAA examination in pilots over 35 yrs. of age.

R 18

27,511  
Geisler, M.A. & Bell, C.F., Jr. INCREASED OPERATIONAL CAPABILITY THROUGH LOGISTICS ANALYSIS. Rep. P 3233, Sept. 1965, 19pp. Rand Corporation, Santa Monica, Calif. (AD 622766)

This paper is a briefing prepared for the World Wide Materiel Conference at Orlando Air Force Base in October 1965. It contains a review of current logistics research and a discussion of selected projects. The research is categorized thus: support of new systems and operational concepts, new logistics hardware, and support concepts and policies. From the first category the logistics-operations interaction model and initial support planning work are considered; from the second, automated base maintenance control and programming by questionnaire; and from the last, the alert aging study and aggregate base stockage model.

R 1

27,512  
Cooperband, A.S. & Alexander, L.T. THE DETECTION OF COMPOUND MOTION. Report from: "45th Annual Meeting of the Western Psychological Association, Honolulu, Hawaii, 1965." Rep. SP 1946/001/00, July 1965, 12pp. System Development Corporation, Santa Monica, Calif. (AD 622007)

An analysis of the geometry of the 2-target collision prediction situation, and of related research, when taken together suggested that w, the rate of change of the relative bearing between the 2 targets, could be a sufficient cue for collision prediction. An abstraction of the geometric situation was used to study the ability of an observer to detect a rotational motion superimposed on a translational motion. The results indicated that w was used as the cue for detecting this rotational component of motion.

R 4

27,513

Bitzer, D.L., Lyman, E.R. & Easley, J.A., Jr. THE USES OF PLATO: A COMPUTER-CONTROLLED TEACHING SYSTEM. Contracts DA 28 043 AMC 00073(E) & Nonr 3985(08), Proj. 200145B31F, Rep. R 268, Oct. 1965, 29pp. USA Electronics Command, Fort Monmouth, N.J. (Coordinated Science Lab., University of Illinois, Urbana, Ill.). (AD 623526)

The use of a high-speed digital computer as a central control element provides great flexibility in an automatic teaching system. Using a computer-based system permits versatility in teaching logics since changing the type of teacher merely requires changing the computer program, not the hardware. In addition, having access to the decision-making capacity of a large computer located as one unit permits complicated decisions to be made for each student. Such capacity would be prohibitively expensive to provide by means of decision-making equipment located at each student station. The results of exploratory queuing studies show that the system could teach as many as 1000 students simultaneously without incurring a noticeable delay for any student's request. The educational results thus far have been extremely encouraging. However, reliable conclusions on educational achievement must await the results of more thorough experiments now in progress which include larger numbers of students learning under a variety of conditions. The adaptability and useability of the system for a variety of purposes in education and the behavioral and physical sciences have been clearly demonstrated.

R 11

27,514

Butler, B.R., Jr. THE STUTTERING PROBLEM CONSIDERED FROM AN AUTOMATIC CONTROL POINT OF VIEW. (M.S. Thesis). Jan. 1965, 114pp. Purdue University, Lafayette, Ind. (AD 622685)

In this study, a model of the human speech system has been developed. This model is a nonlinear, variable gain, feedback control system with a number of time delays. Compared with the human speech system, the model is a very simple one. Still, it is the first of its kind and it does permit investigation of the stuttering problem. 7 instabilities in the speech system were investigated although due to the limited knowledge of the brain, all of the instabilities could not be investigated in detail. An investigation of this model from an automatic control point of view indicated that the middle ear, a variable low frequency gain device, was a possible cause of stuttering. Using both analog and digital computer models, this instability was tested with 5 different clinical techniques that decrease or stop cause of stuttering. The number of instabilities that were found further indicates that there are probably more than one cause of stuttering. The different forms that stuttering takes substantiates this point of view. An effort to classify stuttering by the various forms it takes may be helpful not only in locating a cause but helping to indicate the type of therapy that will produce the best results.

R 67

27,515

Turner, W.R., Smyth, C.C. & Jacobs, J.E. ULTRASONIC IMAGING. Report from: "Proceedings of a Symposium, University of California, Berkeley, California, December 1-2, 1964." Contract Nonr 2300(10), NRC:MAC:2016, April 1965, 75pp. US Mine Advisory Committee, NRC, Washington, D.C. (AD 621372)

This report consists of 3 papers which outline the state-of-the-art in the conversion of reflected acoustic energy into a visual image. The underlying principles of ultrasonic imaging, the various types of image sensors, and the potentials and limitations of various techniques are discussed in detail.

R 29

27,516

Vitale, H.S. A STUDY OF CHARACTER RECOGNITION PARAMETER ANALYSIS. FINAL REPORT JULY 1964-JULY 1965. Contract AF 30(602) 3488, Proj. 5591, RADC TR 65 282, Sept. 1965, 70pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Computer Lab., General Electric Company, Sunnyvale, Calif.). (AD 621577)

An adaptive measurement technique for classifying the quality of printed text encountered in applications of optical print reading machines is presented. The measurement technique utilizes the learning properties of adaptive threshold logic. The convergence rate of the adaptive process is taken as a figure-of-merit for classifying print quality. Rapid convergence is associated with good quality printing while slow convergence is an indication of poor quality. A review of adaptive threshold logic is presented as an aid for describing the measurement technique. To implement the technique, threshold logic is simulated with the aid of a digital computer and high-resolution images of actual printed text are used as input patterns. The measurement technique is verified and demonstrated by classifying various categories of printed text. The figure-of-merit measurements for each print category is cataloged with an accompanying representative print sample. It is expected that this catalog can be utilized as a comparative aid for estimating the figure-of-merit of printed text encountered in applications of automatic print readers.

R 12

27,517

Swearingen, J.J. TOLERANCES OF THE HUMAN FACE TO CRASH IMPACT. AM 65 20, July 1965, 24pp. US Office of Aviation Medicine, FAA, Washington, D.C. (AD 621434)

Many accident investigators have reported that 70% to 80% of all deaths and injuries in crash decelerations are from face and/or head injuries caused by body flailing and the head striking surrounding structures with less yield characteristics than those of the head. The purpose of the work presented here is to delineate tolerances of each portion of the face and forehead to serve as guidelines for engineers in the design of structures in our transportation environments that would produce less injury upon impact. Man, in a vehicle, is surrounded by rigid tubes, angles, knobs, heavy door posts, sharp instruments, and heavy metal of small radius of curvature (to name a few) all designed to impact the face and head on very small areas. This study has shown that if this environment were changed to a medium-weight deformable metal (without heavy structure directly behind it) with a radius of curvature of 6 to 10 in for energy attenuation and padded with 1 to 2 in of slow return material to contour to the bones of the face and distribute the impact load over the available area of the face, it would be impossible to produce facial and forehead fractures in crash impacts. The limit of human tolerance would then be the forces necessary to produce brain lacerations without fracture.

R 10

27,518

Silver, C.A., Landis, D. & Jones, J.M. DEVELOPMENT OF CRITERIA FOR EVALUATION OF LARGE-SCREEN DISPLAYS. FINAL REPORT. Contract AF 30(602) 3302, Proj. 5597, Task 559705, RADC TR 65 198, Rep. TR 1 052, Aug. 1965, 84pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Franklin Institute Research Laboratories, Philadelphia, Penn.). (AD 621231)

This research was directed toward developing a metric of display quality for evaluation of large-screen displays and toward developing a criterion to validate the metric. 2 approaches were used. In the first, multidimensional analysis (MDA) was used to test the hypothesis that, other things being equal, display quality was related to the number of perceived dimensions of information content; the results of the test failed to support the hypothesis. In the second approach, a game situation was used in which the monetary value of the S's decisions could be calculated. Several display parameters, including format, information density, and color, were manipulated. The monetary value of the decisions, or "decision value," was found to be a reliable and valid measure of display quality. It is recommended that MDA and decision quality be combined to formulate a predictive model of display quality. Research to this end should be conducted using a wide range of stimuli and S proficiency levels.

R 6

27,519

Robinson, Jane & Marks, Shirley. PARSE: A SYSTEM FOR AUTOMATIC SYNTACTIC ANALYSIS OF ENGLISH TEXT. PART I. Contract AF 49(638) 700, RM 4654 PR, Sept. 1965, 207pp. Rand Corporation, Santa Monica, Calif. (AD 621310)

This is a description of PARSE, a system for the automatic syntactic analysis of English sentences. It is capable of analyzing and labeling the structure of a variety of sentences. The system employs a parsing logic which both applies the grammar exhaustively and disengages it from the routines that apply it to text, so that changes in grammar will not affect the program. The Memorandum describes the linguistic features and details the operation of the program.

R 11

27,520

Robinson, Jane & Marks, Shirley. PARSE: A SYSTEM FOR AUTOMATIC SYNTACTIC ANALYSIS OF ENGLISH TEXT. PART II. Contract AF 49(638) 700, RM 4654 PR, Sept. 1965, 270pp. Rand Corporation, Santa Monica, Calif. (AD 621311)

A listing of the 3 major components of PARSE, a system for the automatic syntactic analysis of English sentences. It contains: a) a glossary of the words used, grouped alphabetically by families; b) a presentation of the words organized by the grammar codes devised for them; and c) a listing of 26 words which, because of their excessive length, would not fit the format and had to be removed from the main body of the glossary. A final section lists errata.

27,521

Methven, T.J. & Hartley, R.A. OZONE IN AIRCRAFT CABINS. Tech. Rep. 65083, UDC 629.13.067. 4:546,214, April 1965, 38pp. Ministry of Aviation, Farnborough, Hants, England. (AD 470665)

Existing information is examined on the distribution of ozone in the atmosphere, its physiological effects, and methods of dissociating it, to assist design of air supply systems for aircraft pressure cabins. Ozone concentrations in cabins may reach a dangerous level at altitudes about 50000 ft. There is little useful evidence on the dissociation of ozone in aircraft air conditioning systems. Ground and flight tests have been started at R.A.E. to obtain further information. Some small scale thermal dissociation tests have been made at temperatures up to 600°C. Further work will be done on a larger and more representative test rig, which may also be used for investigating other catalytic methods of dissociating ozone.

R 16

27,522

Metzner, J.J. & Morgan, K.C. WORD-SELECTION PROCEDURES FOR ERROR-FREE COMMUNICATION SYSTEMS. Contract AF19 (628) 4321, Proj. 4610, Task 461003, AFCL 65 461, Tech. Rep. 400 113, June 1965, 73pp. USAF Cambridge Research Labs., Hanscom AFB, Bedford, Mass. (Electroscience Research Lab., New York University School of Engineering & Science, Bronx, N.Y.). (AD 621323)

This report describes 3 alternative sets of rules, or procedures, capable of regulating the flow of message words in a feedback communication system--the circulating memory procedure, the interlace procedure, and the "go-back" procedure. The first 2 of these have been mentioned briefly in previous reports and the third has been described elsewhere. The procedures are evaluated and compared with respect to complexity and storage requirements, operational logic, and compatibility with cumulative decision techniques. A preliminary study of their effect on transmission time and hence on system efficiency is also presented.

R 7

27,523

Lange, T.R. OPERATIONAL ENVELOPES FOR CONSERVATIVE ASTRONAUT RETRIEVAL BY TETHERLINE. (M.S. Theses). GA/PH/65 8, Aug. 1965, 70pp. USAF Institute of Technology, Engineering School, Wright-Patterson AFB, Ohio. (AD 621275)

The purpose of this study was to determine in general the conditions for which an astronaut could be recovered to a spacecraft in a circular orbit of 107.56 mi. using a tetherline. Simultaneous differential equations were solved with a digital computer for a large number of recovery trajectories varying initial conditions and recovery parameters. 2 types of tethering systems were examined. It was found that if the astronaut was initially at rest he could be safely recovered from up to 130 ft. away, but that if he had certain initial transverse velocities the safe operating radius was reduced drastically.

R 10

27,524

Kurtz, G.L. LIGHTING SMALL-SHELTER INTERIORS: CRITERIA AND AN EXAMPLE. AMCHS Code 5010.21. 81902, Tech. Memo. 13 65, Aug. 1965, 94pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md.

This report gives lighting criteria and light-system design methods for illuminating small-shelter interiors effectively. It summarizes the amounts of light (quantity) currently recommended for representative visual tasks, as well as the practices for controlling light (quality). Then, to show how these lighting-design methods are actually applied, it describes a lighting system designed for the proposed control cab of a mobile low-power nuclear power plant. This lighting system was evaluated by making a lighting survey in a control-cab mock-up. The results showed the system satisfied the lighting criteria established for the shelter.

R 11

27,525

Kohn, R.C. BICYCLE TROOPS. Contract SD 171, Rep. BAT 171 25, Sept. 1965, 129pp. Remote Area Conflict Information Center, Battelle Memorial Institute, Columbus, Ohio. (AD 621361)

The report presents a history of the use of bicycles for transportation by combat troops prior to World War I, during World War I and II, and more recently the use of bicycles in guerrilla warfare. The armament, mobility, speed, distance, design, and load-carrying capacity of bicycles for transportation in remote areas and guerrilla warfare are discussed. The effect of terrain on the utilization of bicycles, the organization, strength, and tactics of bicycle units, and the training of combat troops using the bicycles are also considered.

R 75

27,526

Hilgendorf, E.L. THE INDIRECT MEASUREMENT OF TASK DIFFICULTY. Rep. ARL/H.E. 4, Oct. 1965, 18pp. Aeronautical Research Labs., Australian Defence Scientific Service, Department of Supply, Melbourne, Australia.

The 4 experiments are concerned with the development of a technique for the measurement of complex and skilled tasks in terms of information theory. Performance on a key pressing task of varied information input was related to the "spare mental capacity" of the operator by measuring his performance on a secondary task. It was found that a sensory threshold task was unsuitable for this purpose but that a secondary 'attention' task was lawfully related to information input on the primary task. It appears that a secondary task which is suitable for the measurement of "spare mental capacity" must satisfy several specified criteria.

R 14

27,527

Hauty, G.T. & Adams, T. PILOT FATIGUE: INTERCONTINENTAL JET FLIGHT. 1. OKLAHOMA CITY----- TOKYO. AM 65 16, March 1965, 22pp. US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla. (AD 621433)

Of the several conditions that produce pilot fatigue, one has been selected for specific and systematic experimental study. This condition, for the intercontinental-air-carrier crew reputedly consists of the disruption of physiological day-night cycling occurring as a consequence of rapid translocation through many time zones. Due to biological lag time, these physiological readjustments can be expected to have the additional effect of attenuating recuperative processes. The predicted result, which in fact has been claimed by operating air crews, is an undesirable level of both acute and chronic fatigue. A project consisting of a series of intercontinental flights was designed for the purpose of obtaining information that would reveal, firstly, the severity of the problem as it relates to the proficiency, reliability, and health of the pilot and, secondly, what might be done to mitigate those consequences found to be adverse or undesirable. Findings from a preliminary flight (pilot study) are reported here: a) As indicated by mean rectal temperatures, 3 to 5 days were required for the primary phase shift and 1 day for the back shift; b) Interindividual differences in lag time were profound in that a completed phase shift was shown on the first day in Tokyo by 1 S, while at the other extreme, another S did not demonstrate a normal phase shift on any of the days in Tokyo; c) Behavioral integrity was degraded during the transitional period in Tokyo and, to a lesser extent, during the period of transition back to the environment or origin.

R 15

27,528

Hannah, L.D., Boldovici, J.A., Altman, J.W. & Manion, R.C. THE ROLE OF HUMAN FACTORS TASK DATA IN AEROSPACE SYSTEM DESIGN AND DEVELOPMENT. FINAL REPORT, 15 JUNE 1964-15 FEBRUARY 1965. Contract AF 33(615) 1557, Proj. 1710, Task 171006, AMRL TR 65 131, Aug. 1965, 87pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (American Institute for Research, Pittsburgh, Penn.). (AD 621379)

On the basis of information gathered from generators and users of human factors task data by both interviews and questionnaires and by a review of relevant literature, human factors personnel and data were identified, the relations between them described, and recommendations for an automated human factors task data handling system proposed. Human factors personnel were clearly divisible into 4 hierarchically arranged groups: Program Level Managers, Personnel Subsystem Managers, Department Heads, and Nonmanagerial Personnel. In general, and for the populations described, managers or supervisors were the principal users and non-managerial personnel the principal generators of human factors data. A framework that permits classification of both formatted and unformatted data was proposed as responsive to the generally felt need by data generators and users for more orderly "book-keeping" in the human factors realm. Desirable characteristics of an automated human factors task data handling system were derived from the questionnaire responses. The responses also indicated that: a) about 80% thought some use could be made of computers in their work; b) retrieval time was important to at least 80%; c) current modal data retrieval times range from 1 to 6 days; d) about half of the respondents were dissatisfied with current data retrieval times; e) retrieval times of less than 1 day would probably not be used more than twice a month by each respondent. Recommendations for implementing the system included steps necessary to design and apply it on a modest scale consonant with current system development.

R 8

27,529

Gogel, W.C. EQUIDISTANCE TENDENCY AND ITS CONSEQUENCES. Psychol. Bull., Sept. 1965, 64(3), 153-163. (University of California, Santa Barbara, Calif.).

The equidistance tendency is the tendency for objects or other inhomogeneities in the field of view to appear at the same distance as each other with the strength of this tendency being inversely related to directional separation. The evidence for the existence of the equidistance tendency and for its ability to modify the perceived depth resulting from size or stereoscopic cues is reviewed. The equidistance tendency is discussed as a disturbing factor in visual experimentation and as a necessary factor in the understanding of Emmert's law, the moon illusion, and similar phenomena. Several possible explanations for the equidistance tendency are evaluated briefly in terms of the range of phenomena with which it is identified.

R 51

27,530

Drabek, T.E. LABORATORY SIMULATION OF A POLICE COMMUNICATION SYSTEM UNDER STRESS. Contract AF AFOSR 572 65, Proj. 9779 01, AFOSR 65 1714, 1965, 325pp. USAF Office of Scientific Research, ARDC, Washington, D.C. (Behavioral Sciences Lab., Ohio State University Research Foundation, Columbus, Ohio). (AD 621192)

A laboratory simulate of the communication system of a metropolitan police organization was constructed to a) analyze organizational stress; b) explore the utility of realistic simulation as a technique for the analysis of complex organizations; and c) test selected aspects of the theoretical framework by subjecting the constructed simulate to stress. The simulate involved 4 police officers and 26 simulators. It was found that the simulate behaved exactly as its real counterpart. The central hypothesis of the framework was supported, i.e., if there is organizational stress, then there will be change in organizational performance structure.

R 125

27,531

Collins, W.E. ADAPTATION TO VESTIBULAR DISORIENTATION. II. NYSTAGMUS AND VERTIGO FOLLOWING HIGH-VELOCITY ANGULAR ACCELERATIONS. AM 65 24, Sept. 1965, 10pp. US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla. (AD 621435)

Several professional figure skaters who, as part of their daily routine, subject themselves to strong semicircular canal stimuli, were given a series of laboratory tests consisting primarily of caloric irrigations and mild angular accelerations. Brisk nystagmus and clear turning sensations were consistent findings in total darkness. Motions pictures and telemetered eye-movement recordings were then obtained during and following the skaters' normal spins on ice. M peak velocities of 235-278 rpm were achieved by 4 of the skaters. Vigorous nystagmus and dizziness or turning sensations occurred following spins when visual fixation was not permitted. Loss of equilibrium and disorientation also occurred when the skaters attempted to maneuver after their spins without visual cues. The notion that complete suppression of vestibular responses occurs in figure skaters as a result of their repeated exposure to high velocity angular accelerations is not upheld by the present data.

R 5

27,532

Craig, F.N. EFFECT OF PREVIOUS POSTURE ON CARDIAC ACCELERATION AT THE BEGINNING OF EXERCISE. Proj. IC522301A079, Task IC522301A07901, CRDLR 3268, March 1965, 9pp. USA Chemical Research & Development Labs., Army Chemical Center, Edgewood Arsenal, Md. (AD 621529)

3 Ss rested in the supine position, arose quickly, and ran for 1 min on a treadmill. Again, they stood erect for 1 min and then ran. For the first 30 beats at the beginning of the run, the acceleration of the heart was greater after supine than after standing rest. The acceleration after supine rest then declined. The difference in cardiac rate arising from previous posture was insignificant for the last 30 sec of the run. Environmental temperatures were 18° and 46°C. The initial difference in acceleration was greater at the higher environmental temperature. The effect caused by standing is attributed to pooling of blood in the legs at the expense of the thoracic reserve. From experiments performed under various conditions of posture and environmental temperatures, it is concluded that the distribution of blood between the chest and the periphery contributes to the differences in the degree of acceleration of the heart at the beginning of exercise.

R 8

27,533

Curran, T.E. & Braunstein, D.N. TRAINING UNDERSTANDING OF RELATIVE MOTION: III. GEOGRAPHIC MODEL AND TRADITIONAL INSTRUCTION. FINAL REPORT. Proj. PF017030202, Tech. Bull. STB 66 3, Aug. 1965, 72pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 621172)

2 groups of college students were initially trained in relative motion problem solution through demonstration and application of the relationship between motion on geographic and relative plots (conceptual model method). 2 other groups of Ss received traditional formula-bound instruction. Aptitude and plotting orientation (own ship vs. guide ship as reference) were evaluated. No differences were found between the groups in accuracy of solutions achieved on drills involving change of station maneuvering problems administered immediately after initial training. 9 months later, however, those trained by the conceptual method did better in making inferences concerning the relative motion of 2 ships from plots of actual geographic positions. Conceptual model training increased the solution speed of students who had high relative motion aptitude and decreased the speed of low aptitude students in comparison to their conventionally trained counterparts. No differences were found attributable to plotting orientation. The next step in this research program will be concerned with improving the conceptual model training method.

R 5

27,534

Davies, E.B. CONTRAST THRESHOLDS FOR AIR TO GROUND VISION. Tech. Rep. 65089, UDC 159.931: 612.843, April 1965, 46pp. Ministry of Aviation, Farnborough, Hants, England. (AD 470735)

This paper compares a variety of laboratory detection data on the contrast thresholds of the eye for a variety of target parameters and experimental viewing conditions, such as, target size, background luminance, position of the target image on the retina, type of experimental technique (forced choice or free choice), etc. Data is chosen from this collection for comparison with some limited flight data on detecting ground objects from the air, and it is proposed that contrast thresholds applicable to these practical viewing conditions are obtained from the corresponding laboratory thresholds by increasing the laboratory thresholds by an amount which depends on the degree of difference between the laboratory and the practical viewing conditions. The data applies to zero, or at most small, search situations, and further work is necessary to determine its applicability to widespread search.

R 24

27,535

Parisi, D. SOCIAL REINFORCEMENT AND PERFORMANCE IN PROGRAMED LEARNING IN ITALY. Contracts NR 177 472 & NONR 1834 36, Tech. Rep. 27, Oct. 1965, 32pp. Training Research Lab., University of Illinois, Urbana, Ill. (AD 623025)

This study attempted to assess the effects of social reinforcement on performance in a programed learning task. The 4 experimental conditions that determined the treatment groups were: positive, negative, positive and negative, and no social reinforcement (evaluating feedback). Informational feedback in the branching program used in the experiment was identical for all groups. 108 male high school students were randomly assigned to one of the 4 treatment groups. Results indicate that negative evaluative feedback produced the larger variance in achievement. Performance level is higher when negative reinforcement is given than when it is not given. Positive evaluative feedback reinforcement did not affect performance. The N significant correlations between achievement, on the one hand, and verbal and abstract reasoning aptitudes and 16 PF intelligence factor on the other hand, tends to decrease with increasing social reinforcement conditions. Social reinforcement attenuates the usual correlation between intelligence and achievement test performance following programed learning. Performance on an achievement test is related to such personality variables as deference or lack of need for autonomy when social reinforcement is used. However, no such relationships hold when no social reinforcement is given. In the latter case, performance is related to achievement and exhibitionism.

R 13

27,536

Sells, S.B. & Findikyan, N. DIMENSIONS OF ORGANIZATIONAL STRUCTURE. A FACTOR-ANALYTIC RE-EVALUATION OF THE HEMPHILL GROUP DIMENSIONS DESCRIPTION QUESTIONNAIRE. Contract Nonr 3436(00), Tech. Rep. 7, Nov. 1965, 60pp. Behavioral Research Institute, Texas Christian University, Fort Worth, Tex. (AD 623104)

The research on the Hemphill Group Dimensions Description Questionnaire reported in this paper is a continuation of work directed toward the development of quantitative scales for measuring significant aspects of the social environment which may account for variance in individual and group behavior. This is one phase of a broader research program in which the central theme and broad objective involve description, measurement, and taxonomic classification of environmental variables, physical as well as social, that account for behavior variance. The Hemphill Group Dimensions Description Questionnaire consists of 150 items, answered on a 5-point, Likert-type scale from Definitely True to Definitely False. The Hemphill questionnaire was administered to 967 Ss. The present report involves factor analysis of the intercorrelation matrix of the 150 items, computed for the entire sample of 967 Ss. The 22 factors considered meaningful are presented in Tables, each with a complete testing of items, grouped according to the Hemphill dimensions and item factor loadings.

R 4

27,537

McArthur, B.N. ACCURACY OF SOURCE DATA HUMAN ERROR IN HAND TRANSCRIPTION. FINAL TECHNICAL REPORT APRIL 1964-FEBRUARY 1965. Contract AF 33(615) 1276, ASD TR 65 10, Rep. FMC R 2234, May 1965, 276pp. USAF Logistics Command, Wright-Patterson AFB, Ohio. (FMC Corporation, Santa Clara, Calif.). (AD 623157)

An experimental human factors study of human error in hand transcription was performed. The objectives were to determine under laboratory conditions, the effects on transcription accuracy of certain human factors, source data factors, task factors and environmental conditions. The factors were S age, sex and occupation, arrangement of codes, and code content and structure, transcription method and form design, and work period duration. The general findings were age and sex are significant factors in hand transcription accuracy, the age factor interacts significantly with code content, the sex and occupation factors interact significantly.

R 17

27,538

Minard, L.D., Jr. SOUND RECOGNITION IN A NEURAL NETWORK. (M.S. Thesis). GE/EE/65 15, Aug. 1965, 120pp. USAF Institute of Technology, Engineering School, Wright-Patterson AFB, Ohio. (AD 622988)

The sound patterns for 8 sustained phonemes are used as input to a single-level network of 8 Steele neuromimes. Each pattern is a loudness (neuron firing rate) vs frequency representation of the output from the cochlear section of an electrical analog of the ear. Recognition of a pattern occurs when 1 of the 8 outputs of the network, as designated, becomes greater than all the rest. To meet the requirement for recognition, the learning process involves a matrix transformation that allows the elements of the matrix to change. The transformation used was 20, the dimensionality of each pattern, to 8, the dimensionality of the network output. The network, after careful selection of network parameters, achieved continuous recognition for 3 consecutive cycles of the 8 patterns.

R 15

27,539

Bevan, W. AN INTRODUCTION TO PSYCHOPHYSICS. Report from: "The Evolution of Perceptual Frames of Reference." Contract Nonr 3634 (01), Tech. Rep. 24, Jan. 1965, 12pp. Psychology Dept., Kansas State University, Manhattan, Kan.

This paper presents a brief, general review of the major developments in psychophysics. Topic headings include: a) Fechnerian Psychophysics; b) Stevens and the Power Law; c) Thurstone and the Problem of Response Variability; and d) Helson and Adaptation Level Theory. The practical application of psychophysical methods is discussed and 2 exemplary experiments are reviewed.

R 17

27,540

Helson, H. CONSTANCY. Report from: "The Evolution of Perceptual Frames of Reference." Contract Nonr 3634 (01), Tech. Rep. 30, May 1965, 6pp. Psychology Dept., Kansas State University, Manhattan, Kan.

Much mystery has surrounded the ability of organisms to respond to invariant properties of objects, but a consideration of certain facts enables us to bring phenomena of perceptual constancy within the framework of well-known physiological and psychological processes thus relating them to the wider realm of biological adaptations. These facts may be summarized in a number of principles having general applicability (Helson, 1964). The first of these principles is that organisms adjust their level of response to the level of stimulation. The second principle at work to preserve constant properties of objects is that organisms respond to ratios of stimulation as well as to absolute amounts of energy. A third, often overlooked, principle operative in the perception of object properties is paradoxical from the point of view of the concept of constancy. Constancy is hardly ever perfect. It is always approximate and partial. It is more proper to speak of "approximation" to constancy of "compensation" rather than in terms that imply unchangeable perceptions in the face of all changes in physical input to sense organs. Thus we have constancy with change, the one giving information about invariant objects properties, the other giving information about changes in the relations of objects to the organism. Technically, the facts reduce to this: while some dimensions of perception remain constant with changing stimulation, others do not, with the result that we are able to recognize objects as the same in altered environments. It is by no means univocal when all the facts are considered. Constancy may be reduced and even made to disappear both by altering the field conditions under which objects are seen and by instruction to observers to adopt various attitudes in judging attributes of objects. Thus if one looks through a long, narrow black tube at objects, their color, size, and shape are seen in accordance with the properties of the retinal image, and there is little or no 'constancy'.

R 18

27,541

Karlin, S. & Studden, W.J. OPTIMAL EXPERIMENTAL DESIGNS. Contracts NONR 1100(26), NONR 225(28) & NSF GP 2487, Mimeo. Ser. 57, Oct. 1965, 70pp. Statistics Dept., Purdue University, Lafayette, Ind. (AD 623216)

This paper presents a number of results concerning the theory of the optimal design of experiments initiated and principal developed by Elfving, Kiefer and Wolfowitz. The paper contains approximately half expository and half new material. The proofs are mostly new and presented in a unified manner. The paper contains material on the estimation of linear functions of the regression parameters, extrapolation, minimax estimation, admissible designs and some quadratic loss problems.

R 13

27,542

Katter, R.V. & Holmes, E.H. SEMANTICS OF UNCERTAINTY: SOME PSYCHOPHYSICAL CORRELATES. Report from: "Western Psychological Association Meeting, Honolulu, Hawaii, 14-19, June 1965." Rep. SP 1937, Aug. 1965, 24pp. System Development Corporation, Santa Monica, Calif. (AD 622002)

The making of decisions under conditions of uncertainty is a ubiquitous aspect of the individual's information processing behavior. Consequently, a considerable portion of his communicative activity is occupied with attempts to express the nature of his decision processes. Since the accuracy of such communication is of some social importance, the present study sought to discover the kinds of errors that may occur in communications about uncertain decisions. Experimental Ss were shown statements expressing different degrees of "change" for the occurrence of a certain event, and also statements expressing different degrees of "confidence" in predicting the occurrence or nonoccurrence of that event. In response to each statement Ss adjusted a device that indicated graphically the probability of occurrence of the event that they thought the statement expressed. Results suggest that statements directly expressing the subjective probability of occurrence of an event are seldom misunderstood. Also, it appears that statements expressing high confidence in predicting the occurrence or nonoccurrence of an event are rarely understood. However, statements expressing low confidence in predicting either occurrence or nonoccurrence of an event are frequently misunderstood in any 1 of 3 ways. Some of the possible implications of these findings for social communication and for decision making are discussed.

R 6

27,543

Brodsky, N. (Chm.), LOGISTICS RESEARCH CONFERENCE. VOLUME II - 3. May 1965, 233pp. Airlie Conference Center, Warrenton, Va. (AD 623227)

The papers contained in this volume were prepared for presentation to the panel on Government/Industry Development and Production at the DOD Logistics Research Conference in May 1965. Topics of the papers were as follows: a) integrated logistic support for systems and equipment; b) implementation of integrated logistics; c) logistics considerations in warfare systems development; d) integrated logistics support planning; e) technical data base for integrated logistic support; f) a study of logistics management in the Army; g) improved support of the logistics manager; h) games played in the system acquisition process; i) the designer's impact on logistics; and j) procurement and the systems engineer, etc. (HEIAS)

R many

27,544

Davis, L.W., Wall, F.J. & Summers, D.L. DEVELOPMENT OF "TYPICAL" URBAN AREAS AND ASSOCIATED CASUALTY CURVES. FINAL REPORT. Contract OCD PS 64 47, DC FR 1041, April 1965, 192pp. Dike-wood Corporation, Albuquerque, N.M. (AD 623087)

The development of "typical" urban areas (determined by the land use and the types of building construction) and the associated casualty curves is the subject of this contractual effort. The primary source for information concerning building construction throughout the United States is the Sanborn maps. Specific types of areas within selected cities were chosen for detailed study. Whenever possible, samples were included of downtown business areas, manufacturing areas, commercial (wholesale and warehouse) areas, and various residential areas. A block-by-block, building-by-building survey of information from the Sanborn maps was conducted. Occupancy, block area, etc. were recorded for each building in the block being surveyed. These data were punched on IBM cards, verified, and put on magnetic tape. Computer summaries were then made of these data. From these summaries statistical analyses were made to detect whether any differences in construction occurred for given land uses due to a) geographic region and b) urban area size. From these results lists of typical urban areas were developed. From these basic data it was then possible to draw total mortality and total injury curves for an unwarned population (daytime) for each of the 10 typical urban areas. These curves are presented for surface and the Hiroshima scaled height of burst (846 ft) and for yields of 0.4, 1, 4, 10, 25, and 50 Mt. Capability is also provided for estimating casualties in a nighttime and a warned configuration.

R 5

27,545

Federman, P. & Siegel, A.I. COMMUNICATIONS AS A MEASURABLE INDEX OF TEAM BEHAVIOR. FINAL REPORT. Contract N61339 1537, Proj. 7666 1, Tech. Rep. NAVTRADEVEN 1537 1, Oct. 1965, 83pp. USN Training Device Center, Port Washington, N.Y. (Applied Psychological Services, Wayne, Penn.). (AD 623135)

The relationship between anti-submarine (ASW) helicopter team performance and the content and flow of communications within the team during a simulated attack was investigated. 14 distinct communications variables were found to be correlated with the objective performance measurement criterion (miss distance) employed. The factors were named "probabilistic structure," "evaluative interchange," "hypothesis formulation," and "leadership control." The findings of this study suggest the value of developing scaled performance measures as diagnostic devices for evaluating inflight crew behavior, as predictors of success in the Fleet, and as end-of-course measures. The implications of the findings for training devices and training device problems are developed.

R 9

27,546

Greenly, R.B., Maass, K.K., Meyer, J.W. & Michalik, S.A. UNIVERSAL PRINT READER TECHNIQUES. FINAL REPORT, 30 JUNE 1963-MAY 1965. Contract AF30(602) 3116, Proj. DW 63 48, RADC TDR 64 374, Vol. 1, Rep. 634, Oct. 1965, 600pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Link Div., General Precision, Inc., Binghamton, N.Y.). (AD 623613)

The objective of this program was to provide engineering services directed toward standardization of typewriter fonts and related features for optical scanning application. Primary emphasis was placed on investigation and evaluation of existing typewriter fonts and includes an evaluation of a type font developed by Subcommittee X3-1 on Character Recognition under American Standards Association Sectional Committee X3-1. Investigations were by computer programmed assessment of each font using a technique developed partly under Contract AF30(602)-2642 sponsored by Rome Air Development Center and partly under continuing Link sponsored character recognition efforts. Evaluations were accomplished by extending the vocabulary capacity of a Link Multi-font Page Reader to permit machine reading of a significant volume of typewriter-prepared documents. Reject and error rates were determined in this manner for each of several type styles considered.

27,547

Gupta, S.S. & Studden, W.J. ON SOME SELECTION AND RANKING PROCEDURES WITH APPLICATIONS TO MULTIVARIATE POPULATIONS. Contracts NONR 1100(26) & AF 33(657)11737, Mimeo. Ser. 58, Oct. 1965, 18pp. Statistics Dept., Purdue University, Lafayette, Ind. (AD 623217)

A problem of subset selection for parameters which are not necessarily scale or location parameters is considered. A general theorem dealing with the infimum of the probability of a correct selection for parameters occurring in densities which are Poisson mixtures of arbitrary densities on  $(0, \infty)$  is proved. This theorem is applied to obtain the minimum value of the probability of a correct selection in several cases where multivariate normal populations are ranked according to  $\lambda_1 = \sum_{i=1}^k \mu_i$  ( $i=1,2,\dots,k$ ) and  $\mu_i$  is the unknown mean vector and  $\Sigma_i$  (known or unknown) the covariance matrix of the  $i$ th  $p$ -variate normal population.

R 6

27,548

Dimmick, K. COMMUNICATIONS SYSTEMS IMPLICATIONS OF THAI SPEECH. Contract DA 36 039 AMC 00040(E), Proj. ARPA Order 371 & SRI Proj. 4240, ORD TR 4240 1, PR&C 64 ELN/D 6034, Order 5384 PM 63 91, June 1965, 64pp. USA Electronics Labs., Fort Monmouth, N.J. (Stanford Research Institute, Menlo Park, Calif.). (AD 493557)

The research reported contributes to the understanding of communication system performance with Thai speech, a tonal language having phonemic values in vowel duration and aspiration. Research results are attained by constructing a 250-word Thai intelligibility test in 5 similar 50-word forms. Laboratory system simulations and a standard military radio system are used to compare English and Thai word intelligibility under identical communication conditions. The research indicates that Thai speech transmission does not imply unusual system requirements. Thai intelligibility seems to depend on factors different from those in English, and further research is required to establish the nature of these factors.

R 19

27,549

Abbott, Helen M. & Duddy, J.H. WEIGHTLESSNESS SIMULATION USING WATER IMMERSION TECHNIQUES: AN ANNOTATED BIBLIOGRAPHY. Rep. LMSC 5 24 65 3/SB65 2, July 1965, 46pp. Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif. (AD 623163)

This compilation contains 97 references pertaining to biomedical and behavioral research involving immersion of human Ss. The references are organized under 3 principal topics: a) Physiological Studies, including acceleration, impact protection and physiological responses to weightlessness simulations; b) Human Engineering Studies; and c) Techniques and Personal Equipment Requirements for immersion studies. The references are arranged alphabetically by author or title under each separate topic. An Author Index is included as an aid in locating specific investigators and publications. The references cited are considered to be the principal contributions to the literature during the period from 1951 through July 1965, including both open and government sources.

R 97

27,550

Arbib, M.A. NOTES ON A PARTIAL SURVEY OF CYBERNETICS IN EUROPE AND THE U.S.S.R. FINAL REPORT. Contract AF49(638) 1446, AFOSR 65 1412, May 1965, 152pp. USAF Office of Scientific Research, ARDC, Washington, D.C. (P.E.C. Research Associates, Inc., Boulder, Colo.).

This report is an unedited transcript of the notes the author made as he traveled through parts of Western & Eastern Europe visiting various laboratories where research related to cybernetics is being carried out. The countries visited and discussed include Italy, France, The Netherlands, Germany (East & West), Sweden, Norway, Denmark, Switzerland, Greece, Czechoslovakia, Hungary, and Russia. (HEIAS)

R 34



27,551

Brandon, Arlene C. & Sampson, E.E. DEMAND CHARACTERISTICS VS. PHYSIOLOGICAL NEEDS: A METHODOLOGICAL CRITIQUE OF THE "NEW LOOK" SCHOOL OF PERCEPTION. J. soc. Psychol., Dec. 1965, 67 (Second Half), 343-355. (Psychology Dept., University of California, Berkeley, Calif.).

The purpose of this study is to demonstrate the importance of demand characteristics as a confounding factor in psychological experiments, particularly in those experiments that deal with the "new look" in perception. Previous studies have demonstrated that Ss can pick up cues from the experimental situation and, on that basis alone, respond in a manner consistent with the experimental hypotheses being tested. 1 study which reported a larger number of food responses to ambiguous stimuli under periods of long deprivation could be interpreted according to this concept of demand characteristics. To test this interpretation this study attempted to change the demand characteristics without changing anything else. The experimental Ss were required to eat a large breakfast and then report for the experiment. Each S was told that he was to receive a new and unusual kind of pill that would put his body in a state of hunger even though he might not actually feel hungry. These Ss were then given a placebo. A variety of control conditions were administered. All of the Ss saw 2 sets of ambiguous slides. The basic finding was that the experimental Ss gave more food responses to the slides than the controls whose physiological state was presumably the same. The authors conclude that Ss are often pleased to help the experimenter.

R 15

27,552

Brock, T.C., Edelman, S.K., Edwards, D.C. & Schuck, J.R. SEVEN STUDIES OF PERFORMANCE EXPECTANCY AS A DETERMINANT OF ACTUAL PERFORMANCE. J. exp. Soc. Psychol., Nov. 1965, 1(4), 295-310. (Ohio State University, Columbus, Ohio).

Will the explicit recommendation of action and policy consequences that people might find undesirable produce a less favorable change in their evaluation of an attitude object to which these consequences are attached and less willingness to accept the consequences than if no mention is made of them? 144 Ss were exposed to a communication of the usefulness of a course in the history of science, or to a communication which had an additional final paragraph containing explicitly stated consequences, or to no communication at all. The results indicated that, among the initially unfavorable Ss, those exposed to the explicit version exhibited greater favorableness toward the idea of such a course than did the other Ss. Acceptance of the explicitly stated consequences was not differentially affected by the communications. But Ss given the nonexplicit communication were less likely than the others to reject the possibility of registering for such a course, an action not explicitly mentioned in either version.

R 12

27,553

Glaserfeld, E.V. & Terzi, P. (Princ. Investigators). AUTOMATIC ENGLISH SENTENCE ANALYSIS. FINAL SCIENTIFIC REPORT. Grant AF EOAR 64 54, June 1965, 101pp. Istituto di Documentazione dell'Associazione Meccanica Italiana, Milan, Italy. (AD 622570)

The research summarised in this report consists of 2 parts. a) The LINGUISTICS Group describes work on the Multistore Procedure for analysis of English sentences. Previous reports are given as abstracts and subsequent developments are described. Machine-economies have been introduced in various aspects of the procedure; the general table of correlators has been refined; a corpus of texts has been key-punched and processed to provide data for analysis of explicit correlators; this analysis is partly completed. The procedure for reclassification of intermediate products is described. 5 appendices illustrate the present state of the work. b) the MATHEMATICS Group reports work on aspects of the structure of language. Considering the sentence as codification of thought, and thought as a complex of mental items between which certain relations hold, the report considers the source of these mental items, under 3 headings: a) sense-perceptors; b) reflection; c) inter-personal communication. The structure of language is found to be characterised by the way in which relations between mental items are codified.

R 63

27,554

University of Virginia. VIRGINIA CUTANEOUS PROJECT. 1948-1962. FINAL REPORT. Contracts N7 onr 372 T.O.11 & Nonr 3258(00), Proj. NR 140 598, ca. 1965, 57pp. Psychological Lab., University of Virginia, Charlottesville, Va. (AD 623674)

The present report has several purposes. First, it is intended to meet the formal requirement of rendering a final report to the Office of Naval Research, the Navy having supported, from June, 1948, to July, 1960, through Contract Nonr 474-06 (Project NR 140-598), the bulk of the research accomplished. Since 1960 it has also materially aided the program through an apparatus loan. Second, the report is intended to furnish a statement of progress on research supported, during the past 2 yrs, by a grant from the National Science Foundation (G 13142). Third, the report provides an opportunity for those currently associated with the program to bring their thoughts together, analyze and evaluate research ideas, and gain the perspective needed to set the future trajectory. It consists of summaries and commentaries on all individual projects. Specific topics include: f limits of vibratory perception, vibratory functions for populations of sensitive and insensitive spots, tissue impedance as function of f, vibratory signals and vibratory communication systems, electrical sensitivity and gradients, electrical vs mechanical stimulation and perception.

R 82

27,555

Stinson, P.J. & Walsh, J.E. AN APPLICATION OF THE POISSON APPROXIMATION TO NAVAL AVIATION ACCIDENT DATA. Report from: "35th Session of the International Statistical Institute, Beograd, Yugoslavia, 1965." 1965, 13pp. USN Aviation Safety Center, NAS, Norfolk, Va. & System Development Corporation, Santa Monica, Calif.

The problem considered is 2-fold: a) To develop an index of accident exposure for flying in the United States Navy; and b) To use this exposure index to develop a reasonably accurate estimate for the probability distribution of future accident risks for various model aircraft. The term accident exposure refers to situations in which there is a chance for a Naval Aircraft to have an accident. A first step is to identify those characteristics in flying exposure that are associated with accidents and then weigh each exposure factor by the amount of risk involved with it. Of 17 exposure variables considered, it was found that a weighted capability of 2 of the variables, total number of carrier flights and total number of field flights, was the best predictor of accidents for various model aircraft. A Poisson approximation is used to estimate the probability distribution of the number of accidents. The problem of estimating this distribution from past data reduces to that of estimating a single parameter--the mean of the distribution. Development of suitable strata is used as a basis for estimating the parameter for the Poisson distribution. Characteristics are stratified in order to suitably relate past data to the binomial events (accident or nonaccident) per weighted risk unit. The sum of the accident probabilities for the risk units is separately estimated for each stratum. Then, a weighted sum of these statistics, which are adjusted to allow for relative numbers of accidents, is the estimate of the parameter. The accident probabilities associated with each type of aircraft can be computed by using  $P(a=x) = e^{-M} M^x / x!$  as the estimate of the Poisson distribution.

27,556

System Development Corporation. FINAL REPORT ON THE DEVELOPMENT OF OVERALL TRAINING PROGRAMS. Contract OCD PS 64 58, Proj. 4431C, Tech. Memo. (L) 2600/000/01, Aug. 1965, 268pp. System Development Corporation, Santa Monica, Calif.

A comprehensive examination of civil defense training is made. After definition of civil defense objectives, a training program analysis is made which establishes specific training requirements and describes various training program elements. From a perspective including these inputs, the current civil defense training program is analyzed. 3 alternative training programs geared to different funding levels and a "Preparation for Crisis" program are proposed and examined. Evaluation plans for these alternative programs are presented with discussion of cost effectiveness. A theory of instruction for use in civil defense training is presented. Finally, suggestions for further research are made.

27,559

Deutsch, S. HUMAN FACTORS CHALLENGES IN MANNED SPACE FLIGHT. Report from: "National Aeronautic & Space Engineering & Manufacturing Meeting, Los Angeles, California, October 4-8, 1965." Rep. 650809, 1965, 17pp. Society of Automotive Engineers, Inc., New York, N.Y. (Office of Advanced Research & Technology, NASA, Washington, D.C.).

This paper deals with a few of the important problem areas involved in a long duration manned space flight. Some of the problems discussed in detail that will be encountered in an extended space voyage are space vehicle maintenance and extra-vehicular activities, visual skill performance, and manual and automatic control of spacecraft systems. Although some of these areas have been studied in the Mercury and Gemini programs, additional testing must be undertaken before successful extended manned space flights can be carried out.

27,560

Mayo, A.M. MANNED CONTROL--DIRECT AND REMOTE. Report from: "National Aeronautic & Space Engineering & Manufacturing Meeting, Los Angeles, California, October 4-8, 1965." Rep. 650811, 1965, 6pp. Society of Automotive Engineers, Inc., New York, N.Y. (Astronautics Div., Ling-Temco-Vought Aerospace Corp., Dallas, Tex.).

Previous violent controversies concerning the value of manned vs unmanned space exploration are being resolved to a significant degree. Improved understanding of man's role in space exploration and more effective means of utilizing man as a part of "automatic," "remotely controlled," and "directly manned" space exploration systems are evolving. The advocates of both manned and unmanned space exploration are making progress in a direction providing mutual support. As a result, an overall increase in the rate and effectiveness of the gathering of knowledge from space is likely. This paper describes current developments.

27,561

Duchon, P. & Petersen, L.K. ENHANCEMENT OF SPACE POWER-PLANT RELIABILITY BY CREW ACTION. Report from: "National Aeronautic & Space Engineering & Manufacturing Meeting, Los Angeles, California, October 4-8, 1965." Rep. 650810, 1965, 17pp. Society of Automotive Engineers, Inc., New York, N.Y. (Von Karman Center, Aerojet-General Corporation, Glendale, Calif.).

The man-powerplant reliability interface is discussed with emphasis on manned vs automatic sensing and control. Judgment and recognition of powerplant performance and the ability to correct abnormal conditions with man included in redundant-component systems results in higher system reliability. An expression for a man-plus-automatic-redundant-component subsystem is presented that gives the subsystem reliability vs the reliability of its parts.

27,562

Helvey, W.M. BIOMEDICAL REQUIREMENTS FOR MANNED SPACE FLIGHT. Report from: "National Aeronautic & Space Engineering & Manufacturing Meeting, Los Angeles, California, October 4-8, 1965." Rep. 650812, 1965, 6pp. Society of Automotive Engineers, Inc., New York, N.Y. (Missiles & Space Company, Lockheed Aircraft Corp., Palo Alto, Calif.).

The design and planning lead time required for future manned space programs requires that adequate biomedical data be acquired in the immediate future. American and Russian space experience is reviewed in terms of such factors as: weightlessness, dynamic factors, ionizing radiation, cabin atmosphere contaminants, thermal environment, biological rhythms, and psychophysiological factors. Recommendations are then presented for biomedical requirements for second generation manned space flights.

27,563

Adams, C.R., Dunlap, R.D. & Batterton, R.L. MAN-MACHINE ASPECTS FOUR-MAN SPACE CABIN SIMULATOR. Report from: "National Aeronautic & Space Engineering & Manufacturing Meeting, Los Angeles, California, October 4-8, 1965." Rep. 650813, 1965, 23pp. Society of Automotive Engineers, Inc., New York, N.Y. (Missiles & Space Systems Div., Douglas Aircraft Company, Inc., Santa Monica, Calif.).

This paper recapitulates the major design, development, and management of a program for the engineering development of integrated spacecraft environmental control and life support systems and for the solution of man-machine integration problems. The different phases of the program are applicable to a family of manned space laboratories and manned interplanetary space vehicles. Simulation techniques included the use of space-laboratory types of life support subsystems hardware of flight type, but not necessarily of flight weight. Most of the preliminary results of the first phase of this program and future phases are discussed in this paper, and future phases are reviewed.

R 10

27,564

Pradko, F., Orr, T.R. & Lee, R.A. HUMAN VIBRATION ANALYSIS. Report from: "Mid-Year Meeting, Chicago, Illinois, May 17-21, 1965." Report 650426, 1965, 9pp. Society of Automotive Engineers, Inc., New York, N.Y.

A new method has been developed to study the effects of vibration environments upon human beings. The method is usable to assess the effects of random vibration, transients, or sinusoidal wave forms. It is equally effective for synthesis or analysis of applied force, effective mass, impedance, displacement, or acceleration. The linearity of human response to vibration is established. The procedure employs the transfer function technique. Data are presented describing human response to vertical motion for voluntary tolerance and low intensity acceleration. The f spectrum studied was 1-60 cps.

27,565

Severy, D.M. HUMAN SIMULATIONS FOR AUTOMOTIVE RESEARCH. Rep. SP 266, Jan. 1965, 88pp. Society of Automotive Engineers, Inc., New York, N.Y. (Engineering Dept., University of California, Los Angeles, Calif.).

Remarkable progress has been made during the past 20 years in simulation of human Ss operating within engineered environments. Requirements have necessitated devising such varied approaches for human simulation as mathematical models, 2 and 3 dimensional models, partial simulations, animal Ss, and voluntary as well as unintentional human exposures. These provide the objective bases for judging human performance under natural, contrived or engineered environments. The anthropometric dummy has reached a state of engineered performance that reliably depicts the involuntary movements, imposed force magnitudes and directions, gross and superficial trauma, and many other factors indicating the relationship of a human S to his adverse environment. Techniques for working with cadaver material have been advanced to assure a more realistic correspondence with human responses. Advanced instrumentation applied to human simulations facilitates accurate recording of exposure stresses, often with greater objectivity than could be obtained using human Ss. Subminiature and microminiature transducer implants for animal Ss provide a technique for sensing responses without interaction by the instrumentation. For automotive research, applications of human simulation techniques range from static stand-ins to such complex human-environmental interactions as collision movements, immersion, heat stress and many other circumstances which may, on occasion, abuse the human operator.

R 69

27,566

Segel, L. THE VARIABLE-STABILITY AUTOMOBILE. CONCEPT AND DESIGN. "Paper presented at a meeting of the SAE Detroit Section, February 1965." Rep. 650658, SP 275, Nov. 1965, 10pp. Society of Automotive Engineers, Inc., New York, N.Y. (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).

This paper describes the application of the variable stability and response automobile for determining the dynamic characteristics of automobiles and for researching man-machine relationships. As a design tool, the device permits realistic appraisal of machine behavior before advancing to the stage of prototype. It is in this application that the paper discusses 2 general categories, variable feedback and model reference systems, describing the design, components, calibration, utilization, and the various tasks required in the developmental process.

R 9

27,567

Bundorf, R.T. THE VARIABLE-STABILITY AUTOMOBILE. THE USE OF A VARIABLE-STABILITY VEHICLE IN HANDLING RESEARCH. "Paper presented at a meeting of the SAE Detroit Section, February 1965." Rep. 650659, SP 275, Nov. 1965, 9pp. Society of Automotive Engineers, Inc., New York, N.Y. (Research Labs., General Motors Corporation, Detroit, Mich.).

This paper describes the use of the GMR variable stability passenger car in a brief study of driver performance in a maneuvering task. The study was part of a pilot program for evaluation of test methods and equipment for future and more extensive human factors evaluations. 3 distinct types of passenger car directional control characteristics were simulated, and each configuration was driven by each of 6 different drivers through a complex course. The results of the investigation are presented in terms of the average driver performance with each vehicle configuration.

27,568

LeFevre, W. RIDE AND VIBRATION DATA MANUAL--SAE J6a. Dec. 1965, 28pp. Society of Automotive Engineers, Inc., New York, N.Y.

This is the third edition of Ride and Vibration Data to be issued by the SAE Vehicle Dynamics Committee, formerly the Riding Comfort Research Committee. The first edition, prepared in 1945, was confined to basic relationships involved in vehicle suspension and impact energy absorption. However, the treatment of vibration did not go beyond the characteristics of undamped simple harmonic motion. The second edition, issued in 1950, consisted essentially of the original material with the addition of a section on human vibration tolerance. In this new edition, the editorial subcommittee has attempted to include a graphical presentation of damped vibrating system characteristics, aimed at applications to vehicle ride and vibration problems. A detailed description of the scope of this subject matter is given.

R 33

27,569  
Meister, D. & Farr, D.E. DEVELOPMENT OF TESTS TO MEASURE THE UTILIZATION OF HUMAN FACTORS INFORMATION BY DESIGNERS. Contract Nonr 4974 00, Dec. 1965, 131pp. USN Engineering Psychology Branch, ONR, Washington, D.C. (Bunker-Ramo Corporation, Canoga Park, Calif.). (AD 626638)

This report describes 3 4-hour tests developed to determine how human factors information is utilized by designers. It is assumed that greater knowledge of the design process will enable human factors (and other) specialists to communicate more adequately with design personnel and in particular will improve the characteristics of human engineering handbooks written for designers. An appendix to this report presents a theory of design activity in behavioral terms. The tests consist of a series of design problems to which designers must respond by developing conceptual sketches and answering questions concerning the manner in which they use available information. In the first type of test (Design Product Tests I and II) the S is given system requirements and asked to lay out an equipment which will satisfy those requirements. In the second type of test (Design Input Test) the S is given a series of design problems and asked what information he needs and how he would use that information to solve these problems. The difference between the tests is largely a matter of the approach taken; the Design Product Tests represent a longitudinal attack on the designer's behavior, since they cover all of the latter's activity from presentation of the problem to its resolution. The Design Input Test concentrates on individual aspects of the design problem and the designer's analysis of pertinent information.

R 3

27,570  
Blakeslee, D.J. LOW-ALTITUDE VISUAL SEARCH FOR INDIVIDUAL HUMAN TARGETS: FURTHER FIELD TESTING IN SOUTHEAST ASIA. Proj. 22/00, Rep. 65 006, June 1965, 83pp. Military Research & Development Center, Bangkok, Thailand. (Rand Corporation, Santa Monica, Calif.). (AD 468413)

This report is a detailed study of quantitative information on the ability of airborne observers to sight and identify single humans on the ground. The target background for most of the testing was rice paddy with scattered bushes and trees at the end of the dry season in Southeast Asia. An analytical relationship between identification slant range, velocity, search strip width, and visual performance factors was used with the test data. The conclusion is that limiting velocities for effective search for more difficult targets are so low that they lead to high aircraft vulnerability; and increasing the velocity can mean very narrow search strip widths and, therefore, many search passes for complete coverage of large areas, again compromising vulnerability.

R 7

27,571  
Roach, J.W. (Dir.). SURVEY OF STUDIES AND COMPUTER PROGRAMMING EFFORTS FOR RELIABILITY, MAINTAINABILITY AND SYSTEM EFFECTIVENESS. Sept. 1965, 57pp. US Office of the Director of Defense Research & Engineering, Washington, D.C. (AD 622676)

This report represents a preliminary, limited survey of efforts under way or recently completed for computer programming or techniques that are adaptable to computer operations in the areas of system analysis for reliability, maintainability, availability, system effectiveness, cost-effectiveness, system simulation, circuit analysis, and failure mode and effects analysis.

27,572  
Parker, H.W. METHODS IMPROVEMENT TECHNIQUES FOR CONSTRUCTION AND PUBLIC WORKS MANAGERS. Contract NBy 45818, Tech. Rep. 51, Aug. 1965, 127pp. Civil Engineering Dept., Stanford University, Stanford, Calif. (AD 622835)

This report is essentially an introduction to basic methods improvement techniques that have proved to be particularly applicable to construction and maintenance situations. 3 principal subjects are covered: a) The use of the time-lapse camera to record the job for later study and discussion; b) The use of crew balance charts and flow diagrams and process charts to analyze and evaluate current methods and to develop new methods; and c) The use of activity sampling techniques to quickly evaluate the productive output of labor crews. The report will serve as a "how to" manual for an organization or an individual desiring to improve its effective use of men, machines, time or money.

R 35

27,573  
Nichols, J.A. HUMAN FACTORS CONTRIBUTION TO ATTAINMENT OF EFFECTIVE SYSTEMS THROUGH PARTICIPATION IN THE SYSTEM ENGINEERING PROCESS. Report from: "Human Factors Society Ninth Annual Meeting, Dayton, Ohio, 21 October 1965." 1965, 10pp. USAF Systems Command, Hq., Andrews AFB, Md.

This handout has been prepared with the hope that it will furnish Human Factors or Personnel Subsystem technical people with "ammunition" for justifying their participation in the weapon system engineering process. It is based on a study and analysis of Air Force Systems Command Manual 375-5, "System Engineering Management Procedures"-Interim Copy, dated 14 December 1964. The system engineering process described in the manual is used to logically consider and evaluate each of the innumerable military, technical, and economic variables involved in total system design. The generation of a balanced system design requires that each major design decision be based upon the proper consideration of system variables such as: facilities, equipment, computer programs, personnel, procedural data, training, testing, logistics and intra- and inter-system relationships. All considerations must be made within the parameters of time, cost, and performance as defined or developed for the system. The manual is intended to serve as a management tool and is addressed to the definition of system engineering management procedures required to integrate the scientific/engineering skills involved in designing military systems.

27,574

Celentano, J.T., Kohler, G.D. & Wagoner, E.V., Jr. BIO-ASTRONAUTICS LABORATORY RESEARCH TOOL STUDY. FINAL REPORT NOVEMBER 1964-APRIL 1965. Contract AF 08(606) 7039, AFETR TR 65 6, Rep. SID 65 118, April 1965, 218pp. USAF Data & Control Div., Patrick AFB, Fla. (Space & Information Systems Div., North American Aviation, Inc., Downey, Calif.). (AD 469263)

On 5 November 1964, a program was undertaken to develop a research tool for monitoring and analyzing physiological and related vehicle data from manned space vehicles, physiological laboratories, and manned mission simulators. The aim of this tool, to be installed in the USAF Bioastronautics Laboratory at Cape Kennedy, was to correlate data for more accurate prediction and analysis of astronaut performance or physiological degradation. Lack of suitable data led to a system concept facilitating extensive versatility in new system approaches. System capabilities included data processing from input telemetry sources, physiological laboratories, manned mission simulators, and digital/analog FM tape. System outputs were an analytical oscilloscope, high-speed recording oscillograph, strip-chart recorder, line printer, and programmable digital/quantitative displays. Data processing included telemetry sorting, computer analysis, and limit-checking. System compatibility with the BOSU complex was analyzed. The design contained trade-off data for all major hardware items, system interfaces, and major item costs. Equipment recommendations were based on a UNIVAC 1219 Computer and Data Display DD40 Integrated Display Unit. Other equipment was included to augment system operation and support its research function. A system/components specification and equipment list is presented with this report.

R 59

27,575

Brodsky, N. (Chm.). LOGISTICS RESEARCH CONFERENCE. VOLUME II - 4. May 1965, 233pp. Airlie Conference Center, Warrenton, Va. (AD 623228)

The papers contained in this volume were prepared for presentation to the panel on Practical Inventory Theory at the DOD Logistics Research conference in May 1965. Topics were: a) development of the stochastic-demand methods of supply-readiness control being used by the Army; b) implementation of inventory control theory in the Army; c) research problems and accomplishments for Navy inventory management; d) implementation of inventory research findings in the Navy; e) practical aspects of economic order quantities; f) problems of research implementation at the operational level; g) the status of mathematical inventory theory; h) future directions of research in inventory theory; and i) a program library approach for implementing results of logistics research. (HEIAS)

R Many

27,576

Brodsky, N. (Chm.). LOGISTICS RESEARCH CONFERENCE. VOLUME II - 2. May 1965, 87pp. Airlie Conference Center, Warrenton, Va. (AD 623226)

The individual professional papers contained in this volume were prepared for presentation to the Panel on Procurement Practices (Panel 2) at the Department of Defense Logistics Research Conference held at the Airlie Conference Center, Warrenton, Virginia, 26-28 May 1965. They are published for information and background in relation to Panel 2 deliberations. Their titles are: procurement of research and development, government contracting for services, flexible incentives, discussion of cost-plus-award-fee contracts, a view of the DOD cost and economic system as a tool in contract pricing, use of technical direction clauses, proposed research on incentive contracting, ultimate costs in procurement and system and organization for last analysis, proposal of a variable quantity contract, defense vs public utility pricing, roles and functions in contract costs analysis. Also included are abstracts of: a review of air force procurement 1962-1964 and public policy toward subcontracting.

27,577

Landaeta, W. AN INTRODUCTION TO DATA STRUCTURING PROCESS. Rep. SP 2136, June 1965, 22pp. System Development Corporation, Santa Monica, Calif. (AD 622010)

Introduces a basic technique for the design of a Data Table by presenting the idea that computer data structuring is analogous to the structuring of printed forms. Reports that the Data Table is made up of 1 or more of 4 types of entries with an entry consisting of 1 or more items. The main point of Data Table design presented in this paper is that all Data Tables are made up of basic components. States that generally, the type of computer memory has some effect on the Data Table design process; however, the basic design techniques and the Data Table components remain the same.

27,578

Levine, M.V. THE GENERALIZATION FUNCTION IN THE PROBABILITY LEARNING EXPERIMENT. Tech. Rep. 73, June 1965, 110pp. Mathematical Studies in the Social Sciences Institute, Stanford University, Stanford, Calif. (AD 622587)

In some learning experiments with human Ss, it is often observed that informing a S that a particular response is correct appears to alter his tendency to make this response as well as other responses which are in some sense near the reinforced response. Intuitively, a generalization function is a function which measures the magnitude of the effect of informing a S that y is now correct upon his tendency to make the response x in the future. A formal definition must be postponed until a description of the learning process is completed. In this report, we formulate and study some methods for obtaining generalization functions from learning data. First we consider mathematical questions and conclude that the generalization function defined with respect to a slight modification of a familiar learning model is essentially determined by the behavior of the individual S in 1 experiment. Next we show that generalization functions obtained by applications of the methods can be used to predict certain empirical functions with great accuracy. Finally, we study the empirical generalization functions and attempt to describe and account for the relationship between the function and distribution of reinforcements.

R 5

27,579

Tucker, L.R. (Princ. Investigator). THREE-MODE FACTOR ANALYSIS OF PARKER-FLEISHMAN COMPLEX TRACKING BEHAVIOR DATA. Contract Nonr 1834(39), Aug. 1965, 20pp. Psychology Dept., University of Illinois, Urbana, Ill.

A combination method of analysis utilizing Tucker's generalized learning curves and 3-mode factor analysis is tried out on intercorrelations published by Parker and Fleishman of several measures of performance at several stages of practice on a complex tracking task. The results indicated 2 measure factors, directional control and sideslip control; 4 stages of practice factors, very early, middle early, middle late, and very late; and 7 factors of individual differences corresponding to combinations of measure and stages of practice factors. The results were clear so that the combination method of analysis has promise for indicating the structure of relations in similar data.

R 8

27,580

McLane, R.C. & Wolf, J.D. EXPERIMENTAL EVALUATION OF SYMBOLIC AND PICTORIAL DISPLAYS FOR SUBMARINE CONTROL. FINAL REPORT, 31 AUGUST 1963-30 SEPTEMBER 1965. Contract Nonr 3675(00) (FBN) Rep. 1550 FR 1, Sept. 1965, 104pp. Systems & Research Div., Honeywell Incorporated, St. Paul, Minn. (AD 621870)

The Navy has given extensive support to the development of several different integrated display concepts for nuclear submarines. This report describes a research program through which comparative, empirical analyses of these concepts was accomplished, and offers aid in selection of the most promising approach from a systems effectiveness viewpoint. The experiments established guidelines for use of these integrated displays in vehicle control including monitoring and mission plan revision as a function of external constraints such as attacking weapons systems. The experimental approach employed tests designed to reveal differences which have practical significance to the Navy; by measuring tracking performance with and without forced sampling or blanking; recording reaction, judgment, and decision times; and determination of correctness of decisions on problems requiring interpretive judgment, evasive maneuvers, and return to the ore-problem tracking task.

R 9

27,581

Ritter, M. EVALUATION OF AIRPORT LIGHTING CONTROL PANEL. FINAL REPORT. Proj. 450 503 03V, Rep. RD 65 100, Aug. 1965, 29pp. US Systems Research & Development Service, FAA, Atlantic City, N.J. (AD 622862)

The Airport Lighting Control Panel consisting of the Approach Lighting System (ALS) and Visual Approach Slope Indicating System (VASI) remote control units was evaluated. It was concluded that the basic panel consisting of the ALS and VASI remote control units would be operationally suitable for use as an Agency standard provided modifications in the following areas were incorporated: a) Color, contrast, size and type of backlighted pushbuttons; b) audio alarm system, and c) labeling (panel and backlighted pushbuttons). It was further concluded that an interface problem exists between the new ALS panel and field configurations other than the one defined in this report and that an investigation of this area must be accomplished prior to adoption of the ALS remote unit as an Agency standard. It was recommended that the basic panel consisting of the ALS and VASI remote control units be adopted for use in the newly designed FAA tower cabs after the modifications and investigations indicated have been performed. However, inasmuch as no long term reliability data were recorded during this evaluation, either a reliability paper study or testing in an operational facility should be performed to establish failure rates prior to adoption as an Agency standard.

R 1

27,582

Tucker, L.R. (Princ. Investigator). SOME MATHEMATICAL NOTES ON THREE-MODE FACTOR ANALYSIS. Contract Nonr 1834 (39), Aug. 1965, 55pp. Psychology Dept., University of Illinois, Urbana, Ill.

The model for 3-mode factor analysis is discussed in terms of newer applications of mathematical processes including a type of matrix process termed the Kronecker product and the definition of combination variables. 3 methods of analysis to a type of extension of principal components analysis are discussed. Methods II and III are applicable to analysis of data collected for a large sample of individuals. An extension of the model is described in which allowance is made for unique variance for each combination variable when the data are collected for a large sample of individuals.

R 8

27,583

Goldberg, M.E., Hollitch, R.S., Jacobi, G.T., Lauffenburger, H.A., et al. DEVELOPMENT OF THE DETAILED PLAN FOR A RELIABILITY CENTRAL, VOLUME I. FINAL REPORT. Contract AF 30(602) 3426, Proj. 5519, Task 551902, IITRI E6018 3, RADC TR 65 94, Oct. 1965, 225pp. IIT Research Institute, Chicago, Ill. (AD 623195)

Reliability data on electronic components is essential for Air Force System designs, procurement, and specification review. In the past such data has not been available in adequate amounts or with sufficient validation. In addition, it has not been possible to analyze available data to the depth and in the manner required to support design, procurement, and specification review functions. This final report delineates the functions and methods of operation of a Reliability Central adequate to meet these requirements. It constitutes an implementation study leading in progressive steps to an operation which will perform data collection, retrieval, and analysis over a wide spectrum of electronic component parts. Diverse users of analyses both within and outside the Air Force are considered in detail. The report describes the required classes of data, a data processing system required for its acceptance, retrieval, and analysis, and provides detailed description of the proposed outputs and services. Volume One constitutes a detailed plan for the implementation of Reliability Central, together with summary descriptions of its inputs, outputs, and its relation to other groups. Volume 2 contains detailed technical discussions in support of the recommended implementation plan.

R 10

27,584

Goldberg, M.E., Hollitch, R.S., Jacobi, G.T., Lauffenburger, H.A., et al. DEVELOPMENT OF THE DETAILED PLAN FOR A RELIABILITY CENTRAL, VOLUME II. DETAILED CONSIDERATIONS FOR R/C IMPLEMENTATION, FINAL REPORT. Contract AF 30 (602) 3426, Proj. 5519, Task 551902, IITRI E6018 3, RADC TR 65 94, Oct. 1965, 419pp. IIT Research Institute, Chicago, Ill. (AD 623196)

Reliability data on electronic components is essential for Air Force System designs, procurement, and specification review. In the past such data has not been available in adequate amounts or with sufficient validation. In addition, it has not been possible to analyze available data to the depth and in the manner required to support design, procurement, and specification review functions. This final report delineates the functions and methods of operation of a Reliability Central adequate to meet these requirements. It constitutes an implementation study leading in progressive steps to an operation which will perform data collection, retrieval, and analysis over a wide spectrum of electronic component parts. Diverse users of analyses both within and outside the Air Force are considered in detail. The report describes the required classes of data, a data processing system required for its acceptance, retrieval, and analysis, and provides detailed description of the proposed outputs and services.

R many

27,585  
Levelt, W.J.M. BINOCULAR BRIGHTNESS AVERAGING AND CONTOUR INFORMATION. Brit. J. Psychol., Feb. 1, 1965, 56(Part 1), 1-13. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

Binocular brightness averaging has been investigated under 2 conditions: with identical contour information in both eyes and with different contour information. Equibrightness curves are presented for the simple case, in which right and left test fields are identical in pattern but different in luminance. These curves are for the most part linear; i.e. if the weighted sum of left and right luminance is constant, the same binocular brightness impression is produced. The sum of the weighting co-efficients is unity (law of complementary shares). In the absence of eye dominance, the weights are equal; otherwise a correction for eye dominance must be made. If monocular contour information is present in one test field, brightness averaging remains linear, but the weight for that eye increases at the cost of the weight for the other eye. In a region close to a monocular contour (within 1° of visual angle), the weight approaches unity, so that binocular brightness in this region is dependent upon the luminance in one eye only. A suggested explanation of Fechner's paradox is given, and the implications of the approach for the mechanism of binocular rivalry are considered.

R 16

27,586  
Dale, H.C.A. RECENCY IN TWO-CHOICE GUESSING TASKS. Brit. J. Psychol., Feb. 1965, 56(Part 1), 33-44. (Applied Psychology Research Unit, MRC, Cambridge, England).

It has been asserted that negative recency effects are found only in simple tasks where the alternatives remain constant from trial to trial. The experiments reported show that, with alternatives varying from trial to trial under conditions where a simple, obvious rule appears to exist relating the correct alternative to a clue, positive recency is found. But, under conditions where the choice lies between varying alternatives which come from 2 simple categories, negative recency predominates.

R 8

27,587  
McGhie, A., Chapman, J. & Lawson, J.S. CHANGES IN IMMEDIATE MEMORY WITH AGE. Brit. J. Psychol., Feb. 1965, 56(Part 1), 69-75. (Royal Dundee Liff Hospital, England).

A test allowing assessment of the differential changes in auditory and visual short-term retention was given to groups of young, middle-aged, and elderly adults. The results indicated that all Ss found it more difficult to handle visually, as opposed to aurally, presented information. The decline in visual retention was found to increase with age, this being most noticeable after the age of 60 years. The theoretical and practical consequences of these findings are briefly discussed.

R 21

27,588  
Broadbent, D.E. & Gregory, Margaret. ON THE INTERACTION OF S-R COMPATIBILITY WITH OTHER VARIABLES AFFECTING REACTION TIME. Brit. J. Psychol., Feb. 1965, 56(Part 1), 61-67. (Applied Psychology Research Unit, MRC, Cambridge, England).

Choice reactions to tactual stimulation were studied, using compatible instructions (react with the finger that is stimulated) and incompatible ones (react with the corresponding finger on the other hand). It was found that decrease in compatibility increased the effect of number of alternative reactions, of uncertainty about the time of arrival of a stimulus, of a simultaneous distracting task, and of an unequal frequency of arrival of different signals. It was also noted that no significant interaction was found between time uncertainty and number of alternative signals; and that stimuli with a fixed probability of occurrence gave slower reactions when several different stimuli were presented in intervening trials, than when there was only one. The results are interpreted as according with a theoretical mechanism resembling a statistical decision.

R 18

27,589  
Broadbent, D.E. & Gregory, Margaret. SOME CONFIRMATORY RESULTS ON AGE DIFFERENCES IN MEMORY FOR SIMULTANEOUS STIMULATION. Brit. J. Psychol., Feb. 1965, 56(Part 1), 77-80. (Applied Psychology Research Unit, MRC, Cambridge, England).

2 experiments were carried out to investigate further the relationship between age and immediate memory for 2 streams of material applied simultaneously to 2 sensory channels. The material was presented over ordinary television transmitters during programmes, viewers being requested to send in their responses. In both experiments the viewers saw 3 items and heard another 3. In Exp. I all items were digits; in Exp. II both the visual and the spoken items consisted of letters and digits, the viewers being requested to order their responses either channel by channel or class by class. Both experiments showed a deterioration in performance with age which started earlier when the task required rapid alternation between the senses. Exp. II also allowed comparison between the 2 modes of recall: the eye-ear mode resulted in much superior performance.

R 5

27,590  
Sullivan, E.R. AN INVESTIGATION OF AN AUTOMATIC AIRSPEED CONTROL SYSTEM FOR THE KC 135 APPROACH AND LANDING SYSTEMS. (M.S. Thesis). GGC/EE/65 15, June 1965, 129pp. USAF Air University, School of Engineering, Wright-Patterson AFB, Ohio. (AD 619971)

The purpose of this study was to investigate the design of an automatic airspeed control system and its effect on the pitch handling characteristics of the KC-135 when used during landing approaches. The longitudinal equations-of-motion for the KC-135 and the pitch channel of the Bendix PB-20D autopilot were simulated. 3 configurations of an airspeed control system were designed, using root locus techniques, which were added to the simulation and their response tested. Performance was satisfactory for 2 of the configurations; one for a manually flown aircraft, and one for an automatically flown aircraft. The study revealed a difference in the airspeed control system design requirements for a manually and an automatically flown aircraft. Also shown was that an airspeed control system with a response rapid enough to control the airspeed satisfactorily during landing approaches will cause several reversals of the pitch trim of the aircraft caused by the thrust changes and results in a deterioration of the pitch handling characteristic of the aircraft.

R 12

27,591  
 Evans, C.R. SOME STUDIES OF PATTERN PERCEPTION USING A STABILIZED RETINAL IMAGE. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 121-133. (J.J. Thomson Physical Lab., University of Reading, Reading, England).

Using a stabilization device capable of covering 30° of the visual field, targets of various shapes were studied extensively. Very large and consistent differences were found between the percentage disappearances of most targets and this was found not to be a function of length of line or boundary. The presence of corners and intersections in a target increased percentage disappearance. Jagged, angular figures disappeared more than rounded, topologically similar ones. When acute angles were present, the disappearance rate was radically raised. About 10% of the time when a target disappeared, it disappeared as a complete unit, though this figure varied somewhat from target to target and was very high in the case of the circle. A mean of about 15% of all disappearances were 'patterned' or 'structured', and these proportions held true for all subjects tested.

R 11

27,592  
 Brown, L.B. & Houssiadis, L. THE PERCEPTION OF ILLUSIONS AS A CONSTANCY PHENOMENON. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 135-141. (University of Adelaide, Adelaide, Australia).

The view, recently revived, that the non-veridical perception of visual illusions results from size constancy processes set up by the depth features of flat figures has been tested with a series of 8 stimuli. Data collected from experiments with 44 Ss suggest that this view applies only to a limited range of visual illusions and that, therefore, it has not the generality claimed by its proponents.

R 14

27,593  
 Irwin, R.J. & Mills, A.W. MATCHING LOUDNESS AND VOCAL LEVEL: AN EXPERIMENT REQUIRING NO APPARATUS. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 143-146. (University of Auckland, Auckland, New Zealand & Tufts University, Medford, Mass.).

Both the loudness of a sound and the apparent magnitude of a self-produced vocal response (autophonic response) can be described as power functions of sound pressure, although with different exponents. 2 scales, one of loudness, the other of autophonic level, can therefore be specified as a function of the same sound pressures. Under these circumstances theory predicts that loudness should be proportional to the square root of apparent autophonic level. 2 separate but similar classroom experiments were performed, in each of which 1 person made autophonic responses of 6 different magnitudes whose loudnesses were judged by the members of the class. The obtained exponents between the 2 scales so erected was 0.52 in 1 demonstration and 0.53 in the other, thus confirming the prediction. The experiments used no apparatus since the only specification of the stimulus required was that the sound pressure produced by 1 subject should be the same as that judged by another.

R 5

27,595  
 Rachman, S. & Grassi, J. REMINISCENCE, INHIBITION AND CONSOLIDATION. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 157-162. (Institute of Psychiatry, Maudsley Hospital, University of London, London, England).

The inability of the 2-factor theory of inhibition to account for some of the experimental findings on psycho-motor learning has led Eysenck to formulate a new theory which introduces the concept of consolidation. The present experiment describes an attempt to separate the inhibitory factors and the consolidation process. 55 Ss were randomly assigned to one of 4 groups and made to practise on the pursuit rotor for 5 min without a rest. They were then re-tested 4 hours later and reminiscence scores were obtained. The results indicate that if an interfering task is given immediately after the initial practice period is completed, then the process of consolidating the motor learning is adversely affected.

R 13

27,596  
 Eysenck, H.J. A THREE-FACTOR THEORY OF REMINISCENCE. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 163-181. (Institute of Psychiatry, University of London, London, England).

A 3-factor theory of reminiscence is suggested, making use of the concepts of consolidation, reactive inhibition and conditioned inhibition. It is further suggested that the reminiscence phenomenon is highly task-specific, in the sense that different tasks call differentially for the various processes hypothesized. Furthermore, it is suggested that differences in drive conditions, personality, fatigue, drug administration and many other variables impose definite limits to the replication of research findings, and that only specific studies of the influence of these variables, within a given theoretical context, can lead to a proper quantitative theory of reminiscence.

R 88

27,597  
 Inglis, J. & Ankus, Mary N. EFFECTS OF AGE ON SHORT-TERM STORAGE AND SERIAL ROTE LEARNING. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 183-195. (Queen's University, Kingston, Ontario, Canada).

Previous studies have shown that, as age advances, there is a progressive decrease in the ability to respond sequentially to simultaneous stimuli. It has been suggested that this impairment with age is due to a decline in the efficiency of some short-term storage process. In those studies, however, the relation of this process to performance on other learning tasks had not been traced in normal subjects, nor have the possible effects of changes in sensory acuity, perception or attention been adequately controlled. This paper describes the results obtained from 120 normal Ss aged from 11 to 70 yr in their reproduction of dichotic digits a) when the order of recall is left to the free choice of the subject; b) when the order of recall has been specified before; and c) after these digits have been delivered. The correlation of performance on this task with performance on serial learning is also described. The results obtained confirm the view that it is a change in some short-term storage process rather than in any perceptual function which principally affects performance in this kind of experimental situation. Evidence was also obtained that short-term storage is an important, but not a unique component, of longer term learning.

R 28



27,598

Posner, M.I. MEMORY AND THOUGHT IN HUMAN INTELLECTUAL PERFORMANCE. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 197-215. (Psychology Dept., University of Wisconsin, Madison, Wisc.).

This paper is a review of efforts to extend the use of information techniques to tasks which are intellectual in nature. Complex tasks such as problem solving and concept formation are viewed in terms of simpler processes of information transformations and immediate memory. The first section of the paper considers efforts to describe the difficulty of transformations such as occur in arithmetic operations and concept utilization in terms of their informational parameters. The second part considers the relationship of these transformations to tasks which require retention. The final section extends the analysis to the complex sequential tasks of induction, problem solving and reading. The paper as a whole may be considered as a quantitative extension of the view of thinking as skilled performance (Bartlett, 1958).

R 44

27,599

Gibbs, C.B. PROBABILITY LEARNING IN STEP-INPUT TRACKING. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 233-242. (Defence Research Medical Labs., Toronto, Ontario, Canada).

6 men and 6 women tracked stimuli that demanded responses of unequal probability. The control-display relation was directionally incompatible. Half the Ss used their nonpreferred hand. Many large directional errors occurred in early practice and these were amended after a mean delay of 0.24 sec. With continued practice, small errors persisted mainly in responses of low probability but the mean amendment time fell to 0.11 sec. These errors provided new, highly sensitive measures that revealed differences in performance associated with sex, hand preference and probability ( $P < 0.01$ ). The results are compatible with hypotheses that the speed, direction and extent of movement are determined by negative proprioceptive feedback and integral-error control (Gibbs, 1954).

R 19

27,600

Rabbitt, P. RESPONSE-FACILITATION ON REPETITION OF A LIMB MOVEMENT. *Brit. J. Psychol.*, Aug. 1965, 56(Parts 2&3), 303-304. (National Institutes of Health, Bethesda, Md.).

The present experiment was carried out to determine whether a repetition effect might be obtained when neither a signal nor a precise pattern of muscular movements is repeated. Responses following responses made with the same hand were significantly faster than responses made with the opposite hand. The probability of alternations between hands was greater than the probability of repetitions of the same hand, so this effect is not due to expectations. The effect must depend on a CNS 'program' for the selection and organization of a response. (HEIAS)

R 6

27,601

Sable, J., Dodge, M., Dixon, P.J. & Raday, T. DESIGN OF A RELIABILITY CENTRAL DATA MANAGEMENT SYSTEM. VOLUME I. FINAL REPORT, 5 MAY 1964-26 APRIL 1965. Contract AF30(602) 3433, Proj. 5519, RADC TR 65 189, Rep. 1193 TR 3, July 1965, 389pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Auerbach Corporation, Philadelphia, Penn.). (AD 620025)

This report documents the interim design stage of an automatic data processing subsystem for the Air Force Reliability Central. Because of the general-purpose nature of many of the design solutions which had to be developed to meet the Reliability Central operational requirements, this system is referred to as the Reliability Central Data Management Subsystem (RCDMS). In Volume I the design objectives of RCDMS are stated, followed by its functional design description. The use of RCDMS by Reliability Central is then presented, followed by functional specifications of all major RCDMS design elements. In Volume II, RCDMS is compared with other major data management systems which represent the current state of the data processing and information storage and retrieval technologies. All major operational requirements, operational functions, and design aspects are discussed, although some are only initial descriptions. The detailing of design elements specified in this report, and the detailed design of conditional search facilities and of the routines which depend on these facilities, are scheduled to be carried out under a separate RADC procurement. In addition, the detailing of the interface, at machine level, between RCDMS system programs and the RADC Computing Complex hardware/software facilities is scheduled to be executed after the RADC Executive Control Program, Local Control Program, and utility software (which are to be available in time for the Reliability Central Test Operation) have reached a point where detailing of interfaces is possible.

27,602

Marschak, J. & Miyasawa, K. ECONOMIC COMPARIBILITY OF INFORMATION SYSTEMS. Contract 233(75) Proj. 047 041, Working Paper 85, July 1965, 72pp. Western Management Science Institute, University of California, Los Angeles, Calif. (AD 619767)

Whether, for a given user, one information system is preferable to another, depends in general on the payoff function characterizing the user, and not only on the probability distributions of channel in and outputs (events and messages) characterizing the information systems. This remains true when information systems are interpreted as statistical experiments used to test hypotheses. Some pairs of information systems are, however, comparable, in the sense that one is preferable to another irrespective of the payoff function. There exists thus a partial ordering of information systems according to their 'informativeness'. The paper states various conditions under which 2 information systems are comparable: these are certain properties of the distributions of events and messages. Theorems are proved that establish necessity or sufficiency relations between those properties.

R 17

27,603

Snyder, H.L. & Greening, C.P. THE EFFECT OF DIRECTION AND VELOCITY OF RELATIVE MOTION UPON DYNAMIC VISUAL ACUITY. FINAL REPORT, 1 FEBRUARY 1964-31 JANUARY 1965. Contract 4405(00)NR142 184, Rep. C5 447/3111, Jan. 1965, 66pp. USN Physiological Psychology Branch, ONR, Washington, D.C. (Human Factors Dept., Autonetics, North American Aviation, Inc., Anaheim, Calif.).

In this study, human dynamic visual acuity was related to relative stimulus velocity when the stimulus motion contained a vector of motion toward the 0. The specific parameters investigated, and their effects upon visual acuity were: a) Direction of stimulus motion across the retina; b) Angular velocity of the stimulus perpendicular to the line of sight; c) Rate of approach of the stimulus directly toward the 0; d) Exposure time of the stimulus; e) Stimulus pattern. The results were discussed in terms of their application to object recognition from automobiles and low-altitude, high-speed aircraft.

R 12

27,604  
Christensen, K., Nalampoon, A. & Sukhawong, S. VEGETATION AND SOIL ANALYSES OF AMPIRT FOREST TEST SITE, PAK THONG CHAI. Proj 11.50, Rep. 65 013, Feb. 1965, 69pp. Military Research & Development Center, Bangkok, Thailand. (AD 478151)

4 10 x 40 m sample plots were studied in or near the 1,200 x 100-m forest site that was tested during the ARPA Multiband Photographic and Infrared Reconnaissance Tests, AMPIRT. Forest profiles and plans were drawn for each plot. The location, height, diameter, and species of each tree larger than 5 cm in diameter within the plots were determined. Soil samples were taken. The forest was found to be typical Dry or Semi-evergreen forest, generally with a 2-storied canopy. The lower story varies from 2 to 20 ms in height, and the upper story varies from 9 to 27 ms. Estimated ground area covered by the canopy is 88%. Average tree height is 11.7 ms, with an average of 353 trees per acre. Average nearest-neighbor distance was determined to be 1.84 ms among the trees measured. There is considerable undergrowth, making penetrability on foot poor to very poor. Obscuration of horizontal sight lines caused by vegetation was estimated by 2 methods. Measurements were also made of vegetational obscuration of vertical sight lines.

27,605  
Gee, D.L. & Humphreys, A.H. USER REVIEW OF CAMOUFLAGE FOR THE INDIVIDUAL COMBAT SOLDIER IN THE FIELD. FINAL TECHNICAL REPORT. Task 1M624101D46701, Rep. ERDL 1834, Oct. 1965, 140pp. USA Engineer Research & Development Labs., Fort Belvoir, Va. (AD 478709)

This report covers a joint investigation of the camouflage aspects of military combat uniforms entitled, User Review of Camouflage for the Individual Combat Soldier in the Field. The review consisted of a series of experiments designed to evaluate objectively the camouflage characteristics of certain standard and developmental uniforms relative to detection modes expected to be used in future combat. The data derived from each experiment are tabulated and the results presented in the form of numerical and graphical analyses to show probability of detection of the various uniforms in relation to other variables. This report concludes that: a) Valid data on thresholds of detection and probability of detection of individuals as a function of range, posture, and detectors were obtained from which the camouflage capability of current uniforms may be derived; b) the data on probability of detection of individuals are sufficient to provide guidance in the preparation of design objectives and QMR's for development of camouflage combat uniforms; c) the test method designed for and employed in the user review is a valid procedure which is useful for measurement of progress toward personnel concealment objectives of QMR's and QMDO's.

R 3

27,606  
Morsh, J.E. IDENTIFICATION OF JOB TYPES IN THE PERSONNEL CAREER FIELD. Proj. 7734, Task 773401, PLR TR 65 9, April 1965, 136pp. USAF Personnel Research Lab., Lackland AFB, Tex. (AD 622433)

A job inventory covering 11 specialties in the Personnel Career Field and consisting of 260 tasks grouped under 12 duty categories was administered by mail to 1647 airmen in 21 major commands. Incumbents of all skill levels completed a background information sheet and rated on a 5-point scale the relative time spent on tasks. A computerized hierarchical grouping procedure applied to the time spent data was used to identify and describe 34 significant job types. Job types were found to cut across commands and to some extent across grades and AFSCs. Job types identified supported the present mechanized shredout and existing specialties in the Personnel Career Field. Task descriptions of jobs as performed by the several specialties and by groups with differing amounts of active federal service showed that the number and kinds of tasks performed and the time spent on them vary with incumbents' job type, grade, and experience.

R 2

27,607  
Helme, W.H. VALIDATION OF EXPERIMENTAL TOOL AND TRADE KNOWLEDGE TESTS. DA Proj. R&D PJ 2J024701A722, Tech. Res. Note 157, Aug. 1965, 23pp. USA Personnel Research Office, Military Selection Research Lab., OCRD, Washington, D.C. (AD 621700)

In the continuing requirement to maintain the effectiveness of the Army enlisted classification system, new tests are developed or existing tests improved periodically for incorporation into the Army Classification Battery (ACB). The present report concerns research conducted by the New Classification Techniques Task in the validation of 2 new tests, Tool Knowledge and Trade Knowledge, for selected MOS in the mechanical construction field and their comparison with current operational (ACB) tests both singly and in aptitude area composites. Experimental tool and trade knowledge measures were developed and administered to samples of enlisted men in AIT courses in 5 construction MOS. 3 25-item tests derived in each sample (1 measure of tool knowledge; 2 of trade knowledge) were cross-validated in independent samples. Parameter values were obtained in a general enlisted input sample (N = 616). The experimental test composites were compared with ACB composites in terms of predictive effectiveness. The new tests were also assessed as to their contribution to differential classification in the mechanical domain. Results showed the Tool Knowledge and Trade Knowledge tests to be generally more effective predictors of training performance in the 5 construction job areas than the currently operational Mechanical Aptitude (MA) and Shop Mechanics (SM) tests. The new tests gave promise of better differential prediction of performance, as components of the aptitude area scores, than obtained with the MA or SM. Replacement of the 2 ACB measures by one or more of the new tests in a reconstituted enlisted classification system awaits verification in tryout across the full range of Army occupational areas.

R 5

27,608  
McCullough, J.D. COST EFFECTIVENESS: ESTIMATING SYSTEMS COSTS. Sept. 1965, 26pp. Rand Corporation, Bethesda, Md. (AD 622023)

This discussion of concepts, principles, and the general approach toward the development of system cost estimates is intended primarily for users of estimates, rather than for cost analysts. An understanding of cost analysis can assist considerably in the use of cost estimates. Both the value and limitations of such estimates should be better understood for their proper application in cost-effectiveness analysis. Users face a critical task in judging cost estimated and evaluating them as to suitability and credibility. The most obvious measure of the goodness of an estimate, of course, is whether or not it finally proves to be accurate. In the realm of long-range planning, however, that would take about 10 years, and the estimate is meant to serve decisionmakers now. Emphasis therefore must be shifted toward an evaluation of the validity of the study itself and the analysis underlying it. Data, methods, and conclusions must be subjected to intelligent and critical review, and in such a review, the user of cost estimates must pose a number of questions, such as the following: a) Have the quantitative factors been properly identified and measured? b) Have the uncertainties been singled out, described, and, where possible, measured? c) Has the study been properly documented? Have the problem definition, the data and their sources, and the methodology been made explicit?

R 10

27,609

Smith, B.J. TASK ANALYSIS METHODS COMPARED FOR APPLICATION TO TRAINING EQUIPMENT DEVELOPMENT. FINAL REPORT. Contract N61339 1218 S2, Proj. 7568, Tech. Rep. NAVTRADEVEN 1218 5, Sept. 1965, 140pp. USN Training Device Center, Port Washington, N.Y. (Applied Science Associates, Inc., Valencia, Penn.). (AD 475879)

Personnel aspects of modern military systems under development include criteria for selection, for technical manuals, and for training and training equipment, at the least. But these aspects must be somehow translated from human terms, such as the basic abilities for selection, and the learning phase and type for training. The many methods of task analysis developed for this structuring of behavior into system specification differ widely in the aspect to which they are tailored, in the scope of behavior analyzed, in basic task taxonomy, and even in terminology. The purpose of this study was to compare the differences in the features these methods have in common, to examine the theoretical or empiric foundation, and to identify which features are included by some but excluded by others. The focus has been on the applicability to training and training equipment device task analysis requirements. A "single-thread" example of part of a real but unidentified Fire Control System has been followed throughout.

R 25

27,611

Mixon, R.D. THE APPLICATION OF GROUP DECISION MAKING PROCESSES TO THE MILITARY ORGANIZATION. M.S. Thesis. 1965, 48pp. USN Postgraduate School, Monterey, Calif. (AD 475377)

The military on the American scene, comprises the largest and most complex organization known. Multitudinous decision are necessarily an integral of such a system all the way from the basic unit, or level, on through the highest; both in war and in peace. Due to the possible impact on the lives of millions of Americans who comprise the military world, as well as the national security and the gross national produce, it is imperative that the best possible and most timely decisions be reached. In certain areas of responsibility, group-decision making techniques may allow a closer approach to this utopian state. Initially, an overview of the group decision making process is presented as gleaned from available information on the subject. A typical military organization is described to serve as a model for this paper. Some general situations are presented wherein decisions must be or have been rendered and these situations are then compared to the overall procedures suggested in the initial phase of the paper. Finally, a conclusion is drawn as to whether the group decision making procedures can be successfully applied to a military organization.

R 38

27,612

Bourque, D.J. EVALUATION OF RUNWAY IMPRESSION FENCES. FINAL REPORT. Proj. 430 004 01V, Rep. RD 65 85, June 1965, 16pp. US Systems Research & Development Service, FAA, Atlantic City, N.J. (AD 623817)

The runway impression fence was developed by the Air Defense Command of the United States Air Force as a safety device to minimize landings in the undershoot area. The Federal Aviation Agency conducted operational evaluations at Houston International Airport, Houston, Texas, and at Bradley Field, Windsor-Locks, Connecticut, to determine the effectiveness and suitability of the runway impression fence for reducing the likelihood of undershoots at civil airports. Aircraft crossing heights at threshold were measured before and after the installation of runway impression fences. Statistical comparisons of these data were made to determine the effectiveness of the fence. Data were also collected on damage to various fence post designs. It was concluded that runway impression fences are effective in reducing the likelihood of undershoots at civil airports during daylight and not significantly effective at night. It was recommended that runway impression fences be considered as a means of reducing the number of undershoots at runways where short landings would be unsafe and that the final fabrication and installation procedures used at Bradley Field be employed until a superior design is developed through further study and field testing.

27,614

Young, H. A CATALOG OF SIMULATORS FOR TRAINING SPACE FLIGHT PERSONNEL. Contract N0bsr 89288, Proj. SF 0131701, Task 5599, SETE 210/83, May 1965, 284pp. Research Div., New York University School of Engineering & Science, New York, N.Y. (AD 624227)

This document describes various simulators used for training space flight personnel. The report is organized by facility (i.e., NASA centers, Air Force centers, Navy centers, and Army facilities). (HEIAS)

27,615

Williams, D.W. & Dugger, B.C. REVIEW OF RESEARCH ON FLASH BLINDNESS, CHORIORETINAL BURNS, COUNTERMEASURES, AND RELATED TOPICS. FINAL REPORT. Contracts DA 49 146 XZ 242 & OCD 05 63 86, Subtask 2411F, DASA 1576, Aug. 1965, 223pp. US Defense Atomic Support Agency, Washington, D.C. (Bio-Dynamics, Incorporated, Cambridge, Mass.). (AD 475686)

The problem of flash blindness and chorioretinal burns resulting from exposure to the intense energy pulse from a nuclear fireball has been recognized as a potential threat to certain military and civilian population groups. The threat extends for many mi. beyond the range where other immediate nuclear effects may be encountered. A considerable amount of research has been done to determine the thresholds for ocular effects and to develop countermeasures. However, additional efforts are required to assess the operational significance of visual impairment and to develop devices which will provide effective protection for larger population segments. Therefore, a need exists to disseminate critical information to various research and planning agencies. A comprehensive, unclassified review of this problem was prepared, including information from classified weapons test reports. This review includes data on energy production, transmission, and absorption, ocular effects, countermeasure devices, and the variables used to make operational assessments of visual impairment.

R 202

27,616

Thrower, R.N. & Wallace, B. HELIBORNE ILLUMINATION SYSTEM. FINAL REPORT, 10 APRIL-31 JULY 1965. JRATA Proj. 2L 506.0, Oct. 1965, 41pp. USA Combat Developments Command, Ft. Belvoir, Va. (AD 474230)

The Heliborne Illumination System was designed by the Advanced Research Projects Agency, Research and Development Field Unit-Vietnam (ARPA RDU-V) and fabricated in-country to supplement other methods of illumination in night combat operations. The HIS was flown under varying terrain, weather, and operational conditions on training and combat missions. 15 missions were observed by evaluators from the Army Concept Team In Vietnam (ACTIV). Additional data were gathered by interview and discussion with key personnel. Generally, 2500 ft absolute was the most desirable altitude for the tactical employment of the HIS. An observer helicopter is normally required for surveillance of relatively small areas, troop formations, weapons emplacements, fortifications and similar-size targets. The observer helicopter follows the HIS just outside the light beam and at an altitude of 300 to 500 ft. A fire team of 3 armed helicopters trails 500 ft to the rear and at an altitude of 1500 ft absolute to provide protection for the searchlight and observer helicopter and also fire-power for target engagement. The HIS evaluated in this project is a satisfactory interim solution for the increased night illumination requirement. Although a step in the proper direction, it is not the optimum solution and research should be continued to develop a standard aerial illumination system for combat operational use.

R 6

27,617

Coleman, H.J. & Myers, E.L. TERMINAL GUIDANCE SIMULATOR STUDY PROGRAM TEST. "INVESTIGATION OF FACTORS AFFECTING DIFFICULTY OF TARGET ACQUISITION AND IDENTIFICATION." Contract NONR 3684(00), NOR 65 272, ca. 1965, 24pp. Norair Div., Northrop Corporation, Hawthorne, Calif. (AD 474533)

The purpose of this study was to determine what factors or variables relate to the relative difficulty of the transparencies used in Norair simulation studies. It was assumed that the M radial miss distance is related to the difficulty of a transparency. It is also assumed that the relative difficulty of a transparency is related to variables thought to be significant in photo-interpretations. This study attempts to relate the relative difficulty of a transparency as measured by the M radial miss distance of the Ss in the simulation studies and the ratings of 10 Ss rating the transparencies in terms of variables used in photo-interpretation. 10 Ss, 25-50 yrs, evaluated each photograph in terms of the target and then with respect to the 4 quadrants. All ratings on target size and shape; quadrant cue availability; and quadrant homogeneity, brightness, and contrast were made using a 10-point scale. Several rankings were obtained from these scores including the M radial miss distance of the runs made by Ss in an earlier multiple exposure study. Spearman rank order r was used to correlate control and experimental rankings of the photographs. It was found that the primary factor influencing level of difficulty of a photographic transparency is the number of cues that can be used to orient the operator. Target shape also has an important role in recognition and size in ease of identifying the form.

R 12

27,618

Sheldon, M.S. & Zagorski, H.J. PROJECT NORM MISSION I. RESEARCH REPORT. Contract AF 19(628) 5166, Tech. Memo, 2232/001/00, Oct. 1965, 24pp. System Development Corporation, Santa Monica, Calif. (AD 474185)

This document summarizes the results to date of the first phase of Project NORM, a research effort concerned with creating improved methodology for the measurement and evaluation of Air Defense crews. A study of performance with respect to 719 simulated invader flights in 15 different SAGE sectors (Mission I) is described. This study resulted in the identification of improved measures for assessing crew performance as well as a method for evaluating relative crew effectiveness. Additional data from all sectors (Mission II) is currently being assembled for a cross-check on the results obtained for Mission I. Although analysis will not be completed for several months, several recommendations have already been advanced on the basis of the results achieved in the first research phase. These recommendations concern the application of the NORM approach in a field site computer program for simulated SAGE missions, extension of the study to BUIC, and the initiation of a similar study for live SAGE.

R 5

27,619

Legge, D. ANALYSIS OF VISUAL AND PROPRIOCEPTIVE COMPONENTS OF MOTOR SKILL BY MEANS OF A DRUG. Brit. J. Psychol., Aug. 1965, 56(Parts 2&3), 243-254. (University College, London, England).

Skilled manual responses depend upon information about the position of the hand which is to be moved. In order to throw light on the way in which CNS depressant drugs impair skill, an experiment was performed to study the effect of nitrous oxide on the perception of hand position by vision and by proprioception. The results show that these 2 modalities were less efficient in combination than was either separately. The drug increased the variability of performance irrespective of the perceptual conditions. The drug also produced systematic changes in constant error, by its action either on vision or on proprioception. Drug-induced increases in the size of handwriting may be explained as changes which compensate for the effects of the drug on perception.

R 29

27,620

Berry, C., Gelder, M.G. & Summerfield, A. EXPERIMENTAL ANALYSIS OF DRUG EFFECTS ON HUMAN PERFORMANCE USING INFORMATION THEORY CONCEPTS. Brit. J. Psychol., Aug. 1965, 56(Parts 2&3), 255-265.

Effects of differences in mean stimulus information under 2 coding conditions and of sub-anaesthetic doses of nitrous oxide (15, 25 and 35% in oxygen) were investigated in 2 card-sorting experiments with student Ss. In Exp. I, in which conventional playing cards were sorted into 2, 4, or 8 classes, the effect of the drug increased significantly with task complexity. Exp. II, in which cards bearing numerals were used, showed a drug effect which was independent of task complexity measured by mean information per stimulus. Neither result was to be explained in terms of a drug effect on the motor component of the tasks. Reasons for the difference between the 2 experiments are considered in relation to other evidence of effects of central nervous depressant drugs on input processes and short-term memory. The value of communication models for research on effects of drugs on human skills is discussed.

R 21

27,621

Simmons, R.F. NATURAL-LANGUAGE PROCESSING BY COMPUTERS--1966. Report from: "Annual Meeting of the American Association for the Advancement of Science, Berkeley, California, 26-31 December 1965." Contract ARPA SD 97, Rep. SP 2279/000/00, Dec. 1965, 29pp. System Development Corporation, Santa Monica, Calif. (AD 625005)

The eventual goal of language-processing research is the development of highly sophisticated question-answering systems. These would accept natural-language questions, search a multilingual library for pertinent factual text, translate and generate from that widely separated text essays that answered the question at any desired level of detail. Examples of existing question answerers, translators, essay writers, etc., are presented. These examples are evaluated as highly inventive linguistic gadgetry that is still far from practical usefulness. Linguistic, semantic, and psychological problems both of theory and practice must be solved before this gadgetry results in useful systems. Specific difficulties facing researchers in these areas are described. The paper concludes that the strongest existing machine capability with language is that of counting and indexing words of a text. This capability has already made the computer an indispensable partner in concordancing, information retrieval, linguistic analysis, and stylistic and content analysis. Although fascinating linguistic gadgetry is available on computers, the solid contribution so far lies in this well-developed capability of word counting and indexing.

R 2

27,622

O'Connor, J. AUTOMATIC SUBJECT RECOGNITION IN SCIENTIFIC PAPERS: AN EMPIRICAL STUDY. J. Assoc. Computing Machinery, Oct. 1965, 12(4), 490-515. (Institute for Scientific Information, Philadelphia, Penn.). (Reprint) (AD 626555)

2 subject index terms (toxicity and penicillin) from an operating retrieval system were studied intensively to determine how well a computer could assign them. The humanly produced indexing for the system was used as a standard, with some checking for indexer errors. Thesaurus rules failed to identify 1/4 of the toxicity papers. A new rule, using "connection forms," worked for almost all of the nonthesaurus papers. The combined rules identified toxicity papers as well as or better than the human indexers. However, these rules falsely selected as many papers as they correctly identified. False selection was reduced to this level by the use of 2 new indexing rules, relative frequency, and 2 methods previously proposed but not tested. The latter are emphasis measures by syntactic centrality and by first sentence-first paragraph position. The rules for reducing false selection did not work as well for penicillin as for toxicity. Comparisons are made with previous empirical studies. Some possible limitations of thesaurus methods, statistical association, etc. are indicated. Some affirmative suggestions are also made.

R 31

27,623

Harris, J.D. & Naumoff, N.S.R. NOISE SURVEY OF ENGINE ROOMS OF U.S.S. TRINGA. BuMed. Proj. MR005.14 1200 2.03, Memo. Rep. 65 8, May 1965, 4pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 624766)

This second survey was requested to compare the data with that obtained in 1956, as engineroom personnel have been reported suffering hearing defects attributed to noise. Noise was sampled in workspaces at positions commonly occupied by the heads of men standing watches. There were only occasional readings over 95 dB, which is the point for instituting a Hearing Conservation Program according to the Bureau of Medicine and Surgery. It was recommended that reference audiograms be taken on all enginemen personnel before assignment to submarine duty and that examination or monitoring be done thereafter on anyone noting prolonged changes.

R 4

27,624

Hughes, G.W. & Hemdal, J.F. SPEECH ANALYSIS. FINAL REPORT. JANUARY 1962-DECEMBER 1964. Contract AF19(628) 305, Proj. 5628 02, AFCL 65 681, Rep. TR EE65 9, July 1965, 100pp. USAF Cambridge Research Labs., Bedford, Mass. (Purdue Research Foundation, Lafayette, Ind.). (AD 624555)

The limitations of speech recognition procedures which depend solely on acoustic data are discussed. One such "primary recognition" scheme, based on phoneme classification by tracking the acoustic correlates of a set of distinctive features, is presented. Programmed on a digital computer, these logical operations on digitalized spectra of 17-msec samples of speech were tested on some 300 nonsense utterances from 2 talkers. A priori information about individual talker characteristics is incorporated into the logic (single-speaker approach). Comparison of machine performance was made with both the intent of the speaker and with the judgments of listeners. Listeners were presented with the same acoustic stimuli that were machine processed. Some perceptual tests were run on short vowel segments excised from nonsense syllables. Detailed quantitative results are presented only for vowels. They show that man and machine agree about 90% of the time on vowel judgments under these conditions of minimal contextual information. Clear feature boundaries are shown on the F1-F2 plane for the (stressed) vowel utterances. Although these boundaries are not generally valid for more than one voice, simple translations of them may suffice to obtain usable vowel separation for many talkers.

R 26

27,625

Higley, H.G. UNITERMS AND THE LEARNING CURVE. Report from: "31st Meeting and Congress International Federation for Documentation, Washington, D.C., 7-16 October 1965." 1965, 15pp. Research & Statistics Dept., American Chiropractic Association, Washington, D.C. (AD 625027)

The documents used in the storage and retrieval system being developed by the Department of Research and Statistics of the American Chiropractic Association are reports and articles from journals dealing with the human spine. All documents are classified and coded according to concepts. The vocabulary for the thesaurus is developed from the literature being examined, and is not pre-established. The addition of a new term is determined by trends in user's requirements. It was decided to use a uniterm system of coordinate indexing--links and roles. The purpose here is to determine some of the characteristics of the input over a short period of time. More specifically, the frequency of uniterm cards with a given number of entries derived from the input over a short length of time. 500 documents (3 months input) were used. These resulted in 258 uniterm cards with 2755 accession numbers, i.e., 10.68 accession numbers per uniterm card and 5.51 uniterns per document. The tabulated data were best fitted by the power function  $y = ax^b$ . In addition, tabulations from other similar sets of technical literature were examined relative to this equation.

R 15

27,626

Garvin, P.L., et al. A SYNTACTIC ANALYZER STUDY. FINAL REPORT, 1 JULY 1964-30 JUNE 1965. Contract AF30(602) 3506, Proj. 4599, RADC TR 65 309, Dec. 1965, 194pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (Bunker-Ramo Corporation, Canoga Park, Calif.). (AD 626480)

This report documents the work performed under Contract AF30(602) 3506 in the area of machine translation R&D. The aim of this work was twofold: a) evaluation of formal and descriptive grammars from the viewpoint of their applicability to machine aided translation of natural languages; and b) development of an operational grammar (syntactic recognition routine) for purposes of machine aided translation. The operational grammar is based partly on lessons derived from the aforementioned evaluation of grammatical theories. Results of the evaluation of grammar are reported in the body of the report and in a series of appendices. They have led to a confirmation and improvement of the "fulcrum approach" to language data processing and machine translation. Operational grammar described in the report is a further development and improvement of the previous machine translation program based on "fulcrum grammar."

R 24

27,627

Caffrey, J.G. COMPUTERS IN SYSTEMS OF HIGHER EDUCATION. Report from: "AEDS-Stanford Conference, Stanford University, Stanford, California, October 31-3 November 1965." Rep. SP 2213, Dec. 1965, 11pp. System Development Corporation, Santa Monica, Calif. (AD 624937)

Designing an information system requires that the administrator think carefully and make very explicit his objectives and criteria, and some Os feel that such an imperative is a useful discipline in its own right. As the need for regional and inter-institutional use of computer and information systems increases, new arrangements will be needed for cooperation, both vertically and horizontally, among and between institutions and their governing or regulatory boards. Steps will have to be taken to provide training and orientation for all levels of management in higher education, especially in the training of novice administrators who will manage tomorrow's systems of higher education. Using the existing technology (not all of it as yet widely disseminated or well understood), it is possible to draw a picture of the university of tomorrow in which the computer, with its attendant peripheral equipment and software systems, will be a basic and indispensable part of the fabric of management as well as of the total operating and instructional program of the institution. The main problem at the moment is not the technology, which has outpaced its users in higher education, but dissemination, development, and the training of appropriate personnel.

27,628

Baran, P. COMMUNICATIONS, COMPUTERS AND PEOPLE. Report from: "Fall Joint Computer Conference, Las Vegas, Nevada, December 2, 1965." Nov. 1965, 20pp. Rand Corporation, Santa Monica, Calif. (AD 624431)

This address considers "the impact of computer technology upon the communications business and conversely, how good, widespread, low-cost digital communications will allow a dramatic increase in the creation of new types of computer systems." Some of the unappreciated social consequences of this technological development are discussed together with possible remedies to these problems. (HEIAS)

27,629

Brown, J.L. FLASH BLINDNESS. Amer. J. Ophthal., Sept. 1965, 60(3), 505-520. (University of Pennsylvania, Philadelphia, Penn.). (Reprint) (AD 625281)

Possible eye injuries and the change in sensitivity of the eye following exposure to high energy levels are discussed in relation to light from the sun and from atomic bomb bursts. Laboratory studies of the transient, relative blindness which follows exposure to high luminance light flashes are reviewed. A mathematical formulation is presented which permits prediction of the duration of blindness following a bright flash before a known target at specified luminance can be seen. The formulation predicts that elevation of target luminance to 500 ft-L will afford target visibility within 2 or 3 sec after exposure to any blinding flash as long as there is insufficient energy in the flash to cause retinal injury. Various protective techniques are discussed.

R 51

27,630

Bayless, O.L. A PERT INFLUENCED REFLECTIVE THINKING APPROACH TO PROBLEM-SOLVING DISCUSSION. Ph.D. Dissertation, Aug. 1965, 103pp. University of Denver Graduate College, Denver, Colo. (AD 624670)

The primary hypothesis for this investigation was that a PERT influenced problem-solving pattern is just as effective in small face-to-face discussion as the reflective thinking and brainstorming patterns. 24 small face-to-face groups ranging in size from 6 to 11 members were used. 2 problems were discussed; 12 groups discussed one, 12 the other. One was a "more familiar" vandalism in the University of Denver library; the other was a "less familiar" problem concerned with the projected serious shortage of teachers. 8 groups used the "PERT" pattern, 8 the reflective thinking pattern, and 8 the brainstorming pattern. 4 groups in each pattern discussed the library problem, 4 the teacher problem. Results failed to reveal any significant differences in the quality of the groups' "final" solutions. Groups using the brainstorming pattern produced both significantly more ideas and more "good" ideas for the "more familiar" problem (local library vandalism). Groups utilizing reflective thinking produced both significantly more ideas and more "good" ideas on the "less familiar" problem. Questionnaire data indicated that group members who discussed the library problem were: a) more satisfied with their group's decision; b) felt they communicated better with each other; c) believed the procedure they used assisted their group in reaching a decision; and d) considered a problem-solving pattern a definite asset for any group engaged in a problem-solving discussion. So using the reflective thinking pattern perceived their leader as significantly more effective than Ss in the other groups. The findings of the present study tend to substantiate, generally, the hypothesis that the "PERT" pattern is just as effective as reflective thinking and brainstorming as a tool in small group discussion.

R 52

27,631

Miehe, W.H., Shea, J.P., Connelly, J.J. & Schiller, R. STUDY OF PROGRAMMING DOCUMENTATION STANDARDS AND SPECIFICATIONS. FINAL TECHNICAL REPORT, 16 MAY 1965-15 NOVEMBER 1965. Contract Nonr 4958(00), Proj. NAVCOSSACT 90A012, Nov. 1965, 250pp. ITT Data & Information Systems Division, Paramus, N.J. (AD 624521)

The objective of this project was to develop standards and specifications for NAVCOSSACT programming documentation that would be generally applicable to all NAVCOSSACT projects. The standards were to be sufficiently broad, yet detailed enough to be applicable to programming documentation requirements of any NAVCOSSACT software system. The specifications for the various kinds of programming documents were to be derived from, and were to reference, the documentation standards, thereby enabling a consistency of documentation throughout all NAVCOSSACT projects. A hierarchy of documentation was to be established that would provide a logical relationship among documents and would permit sufficient flexibility for appropriately covering all types of software systems. The conclusions in the Report indicate that the program employed was effective for this type of project and the objectives were achieved as embodied in the Appendix.

R 31

27,632

Seubert, J.L. BIOLOGICAL STUDIES OF THE PROBLEM OF BIRD HAZARD TO AIRCRAFT. FINAL REPORT, JULY 1963-30 JUNE 1964. Proj. FAA/BRD A 90, Rep. RD 65 73, June 1965, 26pp. US Systems Research & Development Service, FAA, Washington, D.C. (US Department of the Interior, Wildlife Research Div., Washington, D.C.). (AD 624464)

The objective of this research was to develop methods of minimizing or alleviating bird hazards to aircraft. Investigations included problem analysis; population studies of problem species; the responses of birds to various stimuli; the development and evaluation of bird population reduction methods; and studies of avian sensory physiology. The first international meeting on the bird-airport problem was held in November 1963. At the conclusion of the meeting a resolution was prepared for submission to ICAO and to each of the governments represented. The resolution acknowledged that birds are a problem at many aerodromes. Recommendations were that certain long term and interim remedial measures should be taken, that consideration should be given to the standardization of airplane design requirements, and that a committee of the various civil and military interests concerned would be desirable in each country.

27,633

Winett, J.M. ON-LINE DOCUMENTATION OF THE COMPATIBLE TIME-SHARING SYSTEM. Contract AF 19(628) 500, Proj. 649L, ESD TDR 65 68, Tech. Rep. 387, May 1965, 52pp. Lincoln Lab., Massachusetts Institute of Technology, Lexington, Mass. (AD 624110)

The dissemination of information about computer programs is hampered because of the lack of conformity in documentation, the delays inherent in any distribution system, and the inability to select only desired information without being flooded with information which is not of present interest. An on-line system for storing and retrieving information about the programs associated with the Compatible Time-Sharing System (CTSS) has been developed to be included as a CTSS command. This system will help to document the system commands, supervisor entries, library subprograms, and public programs. These types of programs have been chosen since there is an urgent need for having this documentation available on demand, i.e., on-line.

R 7

27,634

Reed, J.L. & Holland, H.W. UH-1D AIRCREW ARMORED SEAT CRASH SURVIVAL ANALYSES. PRELIMINARY REPORT. Task IP121401A15003, Tech. Rep. USAAVLABS 65 59, Aug. 1965, 42pp. USA Aviation Materiel Labs., Fort Eustis, Va. (AD 624119)

This report contains the results of preliminary crash survival analyses of a UH-1D aircrew armor seat. It describes the reduced crashworthiness of the seat caused by the presence of the aircrew armor and develops suggestions for engineering changes to correct deficiencies. The data used in this study were developed from manufacturers' drawings, military specifications, and other sources.

27,635

Ramishvili, G.S. AUTOMATIC RECOGNITION OF SPEAKING PERSONS. FTD TT 65 1079/1+2+4, TT 66 60080, Dec. 1965, 12pp. USAF Foreign Technology Div., Wright-Patterson AFB, Ohio. (Transl: An Gruzssr. Soobscheniye. (Russian), 1964, 36(2), 279-286). (AD 625303)

Words were not all found to be good information carriers about the individual qualities of the announcer. Most satisfactory recognition of announcers gave such key words, as "you," "yeas," and "I." For the test 210 announcements were used. Each tested announcement was compared with all 20 standards and it was attributed to this announcer with the standard of which it gave the lowest value of divergence R. Recognition results are given. Total percentage of proper recognition was 92/4. If key words would be announced after sufficient training, it could be expected an even greater recognition accuracy even for a much wider circle of announcers. Recognition results could be made more effective when using simultaneously several key words. An increase in their number will equivalently introduce of new signs in the process of recognition. Voting on results, obtained on the basis of all key words, minimizes accidental errors making the entire program more reliable. The necessary condition for this, however, appears to be not only the word selection proper in phonetic ratio, but also the selection of such useful complex at which all the words would bring different cross sections by recognition objects and would bring an additional contribution to each other.

R 5

27,636

Minkowich, A. CORRELATES OF AMBIVALENCE, RISK-TAKING AND RIGIDITY. SCIENTIFIC REPORT, NUMBER 11. AF EOAR 21 64, Aug. 1965, 90pp. Psychology Dept., Hebrew University, Jerusalem, Israel. (AD 624035)

28 males were administered the ambivalence test twice, before and after a procedure of guilt induction. Average hostility remained at the same level but average ambivalence showed a significant decrease. When the individuals reporting mixed feelings after the experimental manipulation were eliminated from data analysis and only those with and without guilt feelings were compared, the "guilty" individuals showed a greater tendency to reduce their hostility after the experimental manipulation. The general reduction of ambivalence for the total sample was mainly caused by the reduction of reaction time and by a greater consistency of ratings in the test. A similar study with a control group will be needed for a more comprehensive interpretation of results.

R 14

27,637

Higgs, W.J. & McGrath, J.E. SOCIAL MOTIVES AND DECISION-MAKING BEHAVIOR IN INTERPERSONAL SITUATIONS. Contract AF 49(638) 1291, Proj. 9779 02, AFOSR 65 1558, Sept. 1965, 145pp. USAF Office of Scientific Research, OAR, Washington, D.C. (Psychology Dept., University of Illinois, Urbana, Ill.). (AD 625387)

An attempt was made to incorporate stable motivational states into the prediction of behavior in interpersonal studies. From the literature on group process 3 kinds of behavior were identified and tentative mappings into corresponding motives were made. The research was conducted in 3 experimental stages; a) The first part investigated whether Ss. would consistently describe their motives in terms of the 3 behavioral areas. Items yielded 3 factors; Affiliation, Prominence, and Achievement; b) The second part constructed reliable scales for measuring these factors; c) The third part was a partial investigation of the relevance of the scales to interpersonal behavior (specifically, a 2-person game situation).

R 59

27,638

Harris, C.S. & Shoenberger, R.W. HUMAN PERFORMANCE DURING VIBRATION. Report from: "Autonetics & Office of Naval Research Joint Symposium on Visual and Display Problems of High Speed Low Altitude Flight, Anaheim, California, 3-5 March 1964," Proj. 1710, Task 171002, AMRL TR 65 204, Nov. 1965, 23pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (AD 624196)

This paper discusses the experimental approaches to the study of human performance during vibration. In addition, the characteristics of mechanical bodily responses to vibration at different frequencies are discussed, and human performance studies of the effects of vibration are compared with recommended long time tolerance curves.

R 33

27,639

Higgins, T.H. SONIC BOOM RESEARCH AND DESIGN CONSIDERATIONS IN THE DEVELOPMENT OF A COMMERCIAL SUPERSONIC TRANSPORT (SST). Report from: "The Seventieth Meeting of the Acoustical Society of America, St. Louis, Missouri, November 3, 1965," SST 65 19, Nov. 1965, 29pp. US Office of Supersonic Transport Development, FAA, Washington, D.C. (AD 624050)

This paper presents a short history of sonic boom research and related operational considerations in the development of a commercial supersonic transport (SST). The most intensive public reaction research program to date was conducted at Oklahoma City, Oklahoma. An intensive research program to determine structural reaction to sonic booms was conducted at the White Sands Missile Range. These 2 programs are discussed and a brief summary of the findings of the programs is presented. The paper concludes that although much has been learned about the sonic boom phenomena through past flight and research activities, additional research and theoretical studies are warranted.

R 5

27,640

Gebhard, R., Gradijan, J.M. & Brooks, F.A., Jr. HANDBOOK FOR THE CONSIDERATION OF TRAINING FUNCTIONS DURING DESIGN OF OPERATIONAL EQUIPMENT. FINAL REPORT. Contract N61339 1450, Proj. 7675, Tech. Rep. NAVTRADEVEN 1450 2, July 1965, 76pp. USN Training Device Center, Port Washington, N.Y. (Dunlap & Associates, Incorporated, Washington, D.C.). (AD 625828)

This Handbook is designed to aid in weighing both "on-system" and "off-system" training during the engineering design stages of system development. It provides a technique for timely help in answering 2 questions: a) what equipment adjuncts are needed to support "on-system" training, and b) how much will "on-system" training cost? Section II, How to Use this Handbook, is a concise guide to detailed procedure supplied in the other sections. Section III, the Approach section, gives guidelines for the "Equipment Designer" in "on-system" vs. "off-system" training decisions. The rationale for these guidelines is also presented. In Section IV, System Type, a N prototypes, based on existing systems which were studied to develop this Handbook, are presented. Recommended training capability, based on the experience of the systems studied, is identified here. Finally in Section VI the practice capability design process is applied to the Polaris-MK 80 and MK 84 supervisor's control panel.

27,641

Calcaterra, P.C. DESIGN GUIDE FOR POLYURETHANE FOAM ISOLATION SYSTEMS. Contract N600(10) 59898, Proj. WepTask RAV03J005/2021/F021 02 02, Prob. 1, NADC AE 6522, Rep. 101, Dec. 1965, 124pp. USN Air Development Center, Aero-Electronic Technology Dept., Johnsville, Penn. (AD 625816)

The advantages of buckling isolators over presently used military standard isolators for the protection of equipment aboard high performance jet aircraft are discussed. The dynamic performance of various foams is compared to the theoretical behavior of buckling isolators based on the experimental results obtained with polyurethane foams. Design guides are presented for the use of polyurethane foams in multifunctional vibration and shock isolation systems based on the experimentally determined dynamic properties of the foam material. Results of tests performed on 1 ATR (B1-D1) size electronic equipment bases, designed and manufactured in accordance with design curves generated for a particular polyester foam, are presented and indicate the suitability of optimizing the use of a particular foam in an isolation system which is to meet specific performance requirements. General manufacturing and quality control techniques applicable to foam isolation systems are discussed. Recommendations for further work are made regarding the generation of design curves for other foams and the effect of combined environments on applicability of the design guides.



27,642

Bouman, M.A. CORTICAL CONTROL OF EYE MOVEMENTS AND VISUAL THRESHOLD. FINAL REPORT, 1 JUNE 1964-1 JUNE 1965. Contract DA 91 591 EUC 3346, Proj. 2J014501B74B, Oct. 1965, 40pp. Institute for Perception RVO-TNO, Soesterberg, The Netherlands. (AD 624790)

Experimental investigations were conducted on the increase in the threshold for visual perception which occurs just prior to, and during eye movements. To measure the visual threshold in the vicinity of eye movement an apparatus was constructed having alternately burning lights. Some time after switching, a flash of short duration of controlled intensity was presented which fell in the vicinity of the S's eye movement. Eye movements were measured by reflection of light from the surface of the eye. The reflection data is fed to a "pattern recognizer" which records the onset of eye movement. The S records whether or not he saw the flash. The threshold for perception as a function of eye movement was measured. The equipment could present one or 2 light flashes to the S. Each light source had a diameter of 7 minutes of arc, with an angular separation between the 2 lights up to several degrees. It was found that the detection of one light flash would facilitate the detection of the other light flash. For example, if the probability of detecting either light, separately, was 0.3, the probability of detecting both together was 0.2, rather than 0.09. This facilitation experiment was then repeated with a resting eye, with the following results, which hold for both the light adapted and the dark adapted eye: a) It is most likely a retinal effect, which affects both rods and cones equally; b) outside the area of summation the distance between the 2 flashes is of minor importance; c) the chance of perception of at least one flash is not influenced; d) the effect of a fluctuating retina is negligible; e) the facilitation is independent of the ratio of Pa and Pb as long as  $Pa \times Pb = \text{constant}$ , where Pa is the probability of detecting light a.

R 32

27,643

Veres, S.A. (Princ. Investigator). INVESTIGATION OF FUSION AND FIXATION DISPARITY LIMITS FOR PHOTOGRAMMETRY. FINAL TECHNICAL REPORT. Contract DA 44 009 AMC 641(X), Proj. 4A011001B350, Aug. 1965, 43pp. Purdue University, Lafayette, Inc. (AD 625217)

It is the purpose of this project to investigate the effects of fixation disparity on floating mark measurements made under photogrammetric conditions using variable measuring marks, variable targets and variable backgrounds. An instrument capable of determining the effects of fixation disparity on floating mark settings was designed and fabricated for this project. Its main features include a semi-transparent mirror which projects the measuring mark into the target space, a large reflecting mirror which permits the observer to be positioned beside the measuring mark apparatus, a screw and slide arrangement which allows the observer to make the floating mark settings in 3 dimensions, an illumination system which moves with the measuring mark to keep the illumination level constant at all setting positions, an arrangement of 3 micrometers which have a 2-inch run and at least reading of 0.001 of an inch for measuring the X, Y and Z settings of the measuring mark, a set of artificial pupils and an adjustable chin rest for positioning the head of the observer in a fixed and comfortable position, and a set of adjustable mirrors on slides which provide for reversed or pseudo vision when required. 3 Ss performed the observations which were limited in number excluding the training observations. It was tentatively concluded that: the measure of fixation disparity can be a useful tool in the determination of the training period; that fixation disparity changes for each individual and is related to the phorias of the Ss; that the largest effect of disparity in the photogrammetric processes seems to be in the orientation.

R 42

27,644

Shearon, J.T. & Sterrett, C.R. THE CONCEPTUAL PHASE OF WEAPON SYSTEMS ACQUISITION, A PARTIAL ANALYSIS. RESEARCH REPORT. M.S. Thesis. GSM/SM/65 20, 22, Aug. 1965, 174pp. USAF Institute of Technology, Wright-Patterson AFB, Ohio. (AD 628010)

The main activity of the Conceptual Phase is concerned with planning and defining requirements for future military systems. This activity occurs primarily between the initiation of AFSC's Technological War Plan (TWP) and the issuance, by USAF, of a Specific Operational Requirement (SOR). Inputs from DOD, USAF commands, etc., which provide basic data for the TWP are discussed. An analysis of each event and activity between the TWP and SOR, excluding RTD development activities, is presented to include purpose, who does it, how it is done, and appropriate references. Several findings, primarily concerning lack of documentation and non-standard terminology, are given.

R 85

27,645

Orne, M.T. PSYCHOLOGICAL FACTORS MAXIMIZING RESISTANCE TO STRESS: WITH SPECIAL REFERENCE TO HYPNOSIS. Contract AF 49(638)728, Proj. 9779 01, AFOSR 65 1161, Sept. 1965, 43pp. Massachusetts Mental Health Center, Boston, Mass. (AD 621400)

Hypnosis and other psychological factors are considered which maximize an individual's resistance to stress. A survey of hypnosis is presented reviewing present knowledge on hypnotically induced anaesthesia, physical capacity under hypnosis, hypnotically induced amnesia, hypnotizability, and posthypnotic suggestion. It is pointed out that hypnosis has its major effect in providing an increase in motivation. A number of other psychological factors which contribute to an individual's ability to tolerate stress are also instrumental in increasing motivation, in much the same way as the hypnotic situation. The entire question of which factors contribute more to the individual's ability to tolerate stress requires empirical clarification.

R 78

27,646

Meredith, Connie W. BINOCULAR RIVALRY: INDIVIDUAL DIFFERENCES IN ITS FUNCTIONAL RELATIONSHIP TO LUMINANCE AND INSTRUCTIONAL CONDITIONS. Contract Nonr 1834 (39), Sept. 1965, 47pp. Psychology Dept., University of Illinois, Urbana, Ill. (AD 624900)

The effect of 2 independent variables, luminance and instructions, upon binocular rivalry rate was investigated. A modified Wheatstone stereoscope was used to present a vertical bar to the left eye and a horizontal bar to the right eye, which produced the alternation of visual fields characteristic of binocular rivalry. Neutral density filters in 12 combinations were placed between the light source and the horizontal bar presented to the right eye in order to vary luminance of the right visual field while the luminance of the left visual field was constant. There were 3 sets of instructions: a) to attempt to slow the rate of change of dominance between the visual fields; b) to attempt to speed the rate of change of dominance between the visual fields; and c) to let the change of dominance occur "naturally." The total N Ss was 60; 10 males and 10 females served under each instructional condition and all Ss experienced the variation in luminance. An analysis of variance was performed; it indicated that luminance and instructions produced significant effects upon binocular rivalry rate, but that there was no interaction between the 2 independent variables. An S-R model accounts for the effect of instructions and a neuro-physiological model accounts for the effect of luminance conditions. The need for an integrative model is pointed out.

R 36

27,647

McKie, D. A MODEL FOR THE GENERALIZABILITY OF TESTS CONSTRUCTED BY STRATIFIED SAMPLING. Ph.D. Dissertation. Contract Nonr 1834 (39), Sept. 1965, 146pp. Psychology Dept., University of Illinois, Urbana, Ill. (AD 624901)

A mathematical model is constructed to investigate the generalizability of tests considered to be constructed by sampling from a stratified universe of items. Items are not assumed to be equivalent, nor test-forms parallel. The basic assumptions are those of Rajaratnam, Cronbach, and Gleser; but though the mathematical development is quite different, the model generates generalizability coefficients whose estimates from test data are precisely those of Rajaratnam et al. They are stratified variants of the Kuder and Richardson formulas 20 and 21. Order relations among them are derived, and certain of their properties are investigated. Predictions from the model are shown to have empirical support. The study thus confirms the results of Rajaratnam et al., and sheds additional light on the behavior of the generalizability coefficients discussed by them.

R 19

27,648

Braunstein, D.N. TRAINING UNDERSTANDING OF RELATIVE MOTION: IV. STATUS AND IMPLICATIONS OF CURRENT RESEARCH. Proj. PF017030202, Tech. Bull. STB 66 5, Aug. 1965, 20pp. USN Personnel Research Field Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 621173)

Results of 3 experiments in training for solution of maneuvering board problems are reviewed. It is concluded that: a) training in understanding of relative motion is difficult under methods of classroom instruction thus far used; b) traditional, formula-bound training was inadequate when transfer of training criteria, involving basic understanding of relative motion, were used; c) a method, emphasizing conceptual model building, inferences, and approximate solutions, shows some promise but needs more development and evaluation. Some needed research is suggested.

R 4

27,649

Leiman, J.M. DECISION THEORY AS APPLIED TO PERSONNEL CLASSIFICATION AND EVALUATION. Report from: "Seventh Conference of the Military Testing Association, San Antonio, Texas, 26-28 October 1965." Rep. SP 2234, Oct. 1965, 20pp. System Development Corporation, Santa Monica, Calif. (AD 625004)

This paper includes: a) a brief introduction to Decision Theory; b) a discussion of some aspects of Personnel Management; and c) a discussion of some ways that Decision Theory may be used to improve some of the current practices in Personnel Management.

27,650

Karush, W. & Dear, R.E. OPTIMAL PROCEDURE FOR AN N-STATE TESTING AND LEARNING PROCESS--II. Rep. SP 1922/001/00, Oct. 1965, 18pp. System Development Corporation, Santa Monica, Calif. (AD 623770)

This paper is a continuation of our work on optimal strategies for presentation of items in an N-trial learning experiment. In SP-1869 and SP-1922 we showed (under certain assumptions) that the following decision rule generated an optimal sequencing: in any trial present the item for which the probability of being in the learned state is least. In the present paper we show that this rule is optimal for a more general learning model than any considered earlier; the new model allows for the possibility that a S may respond incorrectly to a test on an item, even though he "knows" the item.

R 5

27,651

Helm, C.E. SIMULATION MODELS FOR PSYCHOMETRIC THEORIES. Contract Nonr 1858 (15), NSF Grant GB 3402 (Continuation of G 22889), Proj. NR 150 088, Rep. RM 65 17, Nov. 1965, 35pp. Educational Testing Service, Princeton, N.J. (Princeton University, Princeton, N.J.). (AD 625474)

This project is directed to the exploration of the procedures used by psychologists in evaluating a person's performance on a battery of psychological tests or scales. During the course of this research a language was developed and programmed for the 7094 which greatly facilitates the development of test interpretation systems. The basic element of this language is the "sentence-generating operator" which relates a class of verbal material to a pattern of scores. Any operator may appear as an argument of any other operator, making it possible to represent complex decision rules in a natural way. Moreover, the class of verbal material defined by any operator may occur as an element in the verbal material defined by any other operator, making it possible to develop complex linguistic structures as well. The system is being successfully used to produce clinical interpretations of complex profiles of test scores.

R 7

27,652

Hart, G.E., Mattison, F. & Gagner, V. INSTALLATION OF A HOMING BEACON IN A FLOTATION VEST FOR CARRIER FLIGHT DECK PERSONNEL. BuWeps Proj. WF 019 02 09, NRL Probl. R08 46, NRL Memo. Rep. 1668, Dec. 1965, 12pp. USN Research Lab., ONR, Washington, D.C. (AD 627436)

The latest approved model of flotation vest for carrier flight deck personnel was obtained for instrumentation tests. In the event a man falls overboard, there is a need for a radio beacon to provide a homing signal. The situation calls for a beacon that will not require any cooperative assistance from the victim, who may be unconscious. A miniature beacon is under development at NRL that may provide an effective solution provided a reliable means of turning it on can be developed. A flexible built-in antenna that is completely covered by the fabric of the vest appears to provide a solution to the antenna problem. Radio dark room tests gave very promising results. Tests while floating in salt water will be performed as soon as equipment now under construction is available.

27,653

Gifford, E.C., Provost, J.R. & Lazo, J. ANTHROPOMETRY OF NAVAL AVIATORS-1964. WepTask RAE 13C 005/2001/R005 01 01, Probl. Assign. 005AE13 23, BuMed Work Unit MRO05.13 904.1, NAEC ACCL 533, Oct. 1965, 11pp. USN Aerospace Crew Equipment Lab., NAEC, Philadelphia, Penn. (AD 626322)

Body size data for 96 measurements of 1,549 U.S. naval aviators are presented. The techniques of measurement are illustrated by schematic drawings and reference to the literature. Both diametral and surface measurements are included. Dimensions are given in both centimeters and inches. Statistics included are percentiles, Ms, SDs, and coefficients of variation. These data are presented for use by designers of aircraft workspaces and designers of personnel protective clothing and equipment.

R 3

27,654

Dewey, M.L. & Leung, S.E.C. RESEARCH ON THE INFLUENCE OF VARIATIONS IN ENVIRONMENTAL TEMPERATURES ON THE SYSTEMIC EFFECTS OF ALCOHOL ALONE AND IN COMBINATION WITH OTHER DRUGS. FINAL REPORT, 1 JUNE 1963-31 MAY 1964. Contract AF 41(609) 1590, Proj. 8241, Task 824102, AAL TR 65 2, Oct. 1965, 44pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (Hine Laboratories, Inc., San Francisco, Calif.). (AD 475560)

This report summarizes experimental results obtained in the elevation of the effect of alcohol alone and in combination with other drugs as influenced by decreased environmental temperatures. Motor coordination, as measured by ability to maintain equilibrium, deteriorated significantly in animals exposed to cold for 168 hours and administered small doses of alcohol. When animals were habituated by receiving an aqueous solution of alcohol as their only source of fluid intake, equilibrium was impaired to a greater extent in some cold-exposure groups, the total increase in body weight per unit of time was depressed, the absorption rate was greater and oxidation rate slower than in groups habituated at room temperature. While the blood pentobarbital concentration was increased in animals exposed to cold for long periods, cold alone had no effect on the sleeping time induced by pentobarbital, and affected the increased sleeping time resulting from the simultaneous administration of alcohol and pentobarbital only when the 2 drugs were given within a short interval and the dose of alcohol was low. Chlorpromazine has a bivalent effect on body temperature, raising the temperature in animals exposed to cold and lowering the temperature in animals maintained at room temperature or when given to cold exposed animals in combination with alcohol. Cold had a brief effect on the impairment produced by alcohol and chlorpromazine together. Present data do not indicate a prolongation of the time during which performance is impaired due to the combined effects of chlorpromazine, ethyl alcohol, and cold.

R 27

27,655

Custance, A.C. THE USE OF SMALL SKIN SURFACE AREAS FOR WHOLE BODY SWEATING ASSESSMENT. Canad. J. Physiol. Pharmacol., 1965, 43, 971-977. (Defense Chemical Biological & Radiation Labs., Ottawa, Ontario, Canada). (Reprint) (AD 627872)

It is possible to obtain a continuous record of the sweating rate of an active S by monitoring changes in total body weight. However, elaborate equipment is required that is capable of accommodating the treadmill (or other exercising device) as well as the S. The balance must be rugged enough to withstand the movements of the S, yet sensitive enough to respond to small changes in weight. It would be a great convenience to be able, instead, to monitor small representative areas of the skin surface with confidence that they faithfully reflect whole body reactions. In this research, moisture loss from a representative area of the skin of the dorsum under a capsule covering 14 sq. cm was measured by an apparatus which automatically altered the flow of dry air to keep the humidity of the effluent constant. In 4 Ss exercising on a treadmill at 3.5 m.p.h. the correlation coefficient between the area under the curves so obtained and the total body weight loss was very high (more than 0.93), and there was also good correlation after sweating was partially suppressed by atropine. Short-period fluctuations were simultaneous and highly correlated between bilaterally symmetrical areas of skin. It is concluded that moisture loss from a single area of skin can be used to represent changes in the rate and pattern of sweating of the whole body.

R 5

27,656

Cronholm, J.N. NOTE ON THE USE OF THE CORRELATION COEFFICIENT. Psychol. Reps., 1965, 16, p668. (USA Medical Research Lab., Fort Knox, Ky.). (Reprint) (AD 626290)

The use of the Pearson product-moment correlation coefficient is usually regarded as being restricted to situations in which ratio, or at least interval measurement can be attained. This paper shows how the correlation coefficient can be computed from the category frequencies of 2 groups of nominally scaled observations. As a descriptive measure,  $r$  conveys a surprising amount of information about the relationship between 2 groups of observations, and retains its usual statistical properties. It is suggested that the correlation coefficient be considered as a supplement to more commonly used non-parametric measures of association.

R 2

27,657

Cote, A.J., Jr. SYNTHETIC NERVE NETWORKS. WepTasks RREN 04/012/212/1/F008 21/02, RUDC 4B 000/212 1/F001 05 02, RMMO 22 006/212 1/F008 08 07, NOLTR 65 55, April 1965, 126pp. USN Ordnance Lab., Department of the Navy, White Oak, Md. (AD 625225)

Most models of pattern recognition processes are conceived without regard to the difficulties which must be anticipated if one had to fabricate a full scale engineering model embodying the proposed principles. Similarly, most models are concerned with the recognition of stationary, rather than time varying, patterns. In addition, many utilize digitally oriented principles which bear a negligible resemblance to those methods apparently employed by biological systems. This report discusses recognition systems which take into account the fabrication limitations one would expect to encounter in the construction of extremely high density microelectronic pattern recognition systems. The resulting analog systems respond to transient patterns and the various artificial neurons within them exhibit functional behavior comparable to that found in biological prototypes. The application of these principles is first discussed in terms of a visual processing system which would exhibit many of the properties attributed to nerve fibres in the visual systems of frogs and cats, including those line sensing properties attributed by Hubel to fibres in the cat's visual cortex. The manner in which these same principles can be applied to the problem of sound recognition is then considered. Methods of realization, and an important function of learning in such systems, are also discussed.

R 106

27,658

Chaillet, R.F. & Honigfeld, Alfreda R. HUMAN FACTORS ENGINEERING DESIGN STANDARD FOR MISSILE SYSTEMS AND RELATED EQUIPMENT. HEL Standard S 3 65, Sept. 1965, 246pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 623731)

The purpose of this Standard is to provide human factors engineering design principles and detailed criteria. The design principles are expressed as general rules applicable during missile system research and development programs, or as essential items to be considered during design, to insure the incorporation of sound human factors engineering practices. The detailed criteria consist of dimensions, ranges, tolerances and other specific data. The range of acceptable dimensions and other factors may be rather large in some cases. Where only these minimum and maximum data appear, select any value that is within the recommended range. The goal should be the approximation of the optimum dimensions where given, whenever possible.

27,659

Borkowski, E.P. MANPOWER AND TRAINING REQUIREMENTS FOR THE U.S. NAVY SPACE SURVEILLANCE SYSTEM HEADQUARTERS, DAHLGREN, VA. Rep. ND 65 64, June 1965, 71pp. USN Personnel Research Activity, Bureau of Naval Personnel, Washington, D.C. (AD 626526)

The Headquarters of the U.S. Navy Space Surveillance System (NAVSPASUR) is currently manned by 15 Naval Officers and 112 Civil Service personnel. This study was conducted to determine the quantitative and qualitative personnel requirements of Navy personnel assigned to the Headquarters, (NAVSPASUR) in the event of Navy manning at a future date. Navy staffing and training requirements of the NAVSPASUR field stations are not included in this report and will be the subject of a later report. Recommendations are: a) Selection criteria for Machine Accountants assigned to the Processing and Evaluation Division should include training and/or experience on high speed digital computers; b) Due to the level of skill involved and the critical nature of the operation, key personnel should receive an overlapping tour of duty; c) The selection criteria of maintenance personnel for the Headquarters, NAVSPASUR, should include training and/or experience in the maintenance of digital and analog computers.

27,660

Back, K.W. (Princ. Investigator). BASES AND CONSEQUENCES OF SYSTEMS OF COMMUNICATION. ANNUAL STATUS REPORT, 1 OCTOBER 1964-30 SEPTEMBER 1965. Contract Nonr 1181(11), Proj. NR 177 470, Sept. 1965, 36pp. Duke University, Durham, N.C. (AD625422)

A general focus of the programs during the current year which emerges is that of the meaning of group interaction to the individual. This includes the study of communication, or interaction broadly conceived, and becomes also important for applied problems, such as susceptibility to stress, physiologic reactions and emotional contagion and influence in different social settings. The research can be divided into 3 categories--socio-physiological studies, studies on group structure, and studies on the methodology of social research. For conceptual purposes we can consider the interrelation of social, psychobiological and physiological systems in the study of socio-physiology, the essential properties and dynamics on the social level in the studies of group structure and the relations of the systems being observed and the observing system in the study of methodology. For practical purposes the socio-physiological studies lead to the classification of different kinds of stress, its effect on the individual and methods of coping with stress. The studies on group structure leads to usable knowledge of the development of groups and their effect on contagion and communication behavior. The work on methodology helps in understanding the nature of the researcher's interference in natural social processes and helps in design and analysis of a wide range of social research.

R 31

27,661

Boldt, R.F. FACTORING TO FIT OFF DIAGONALS. DA Proj. R&D PJ 2T013001A708, Tech. Res. Note 161, Oct. 1965, 22pp. USA Personnel Research Office, OCRD, Washington, D.C. (AD 625222)

In factoring for conventional purposes, factor loadings are desired which minimize the sums of squares of off-diagonal residuals. Such loadings have been shown to be consistent estimates of the population factor loadings. 2 methods are developed: a generalization of the method of minimum residuals, and an application of the method of steepest descent. The method of steepest descent is superior since it is faster, it gave the right communalities when the communalities were known, and it cannot give imaginary factors. Communalities increase as the number of factors increase--Heywood cases imply an upper bound on the number of factors. When applied to somatotype data, the method improved substantially on centroid solutions and indicated a reinterpretation of earlier factoring studies.

R 15

27,662

Bender, J.A., Kobes, F.J., Kaplan, H.M., Salmon, G., et al. A PROGRAM OF PHYSICAL DEVELOPMENT FOR ARMY RECRUITS TO CONSERVE MANPOWER BY SELECTION AND SPECIAL TRAINING FOR SPECIFIC MILITARY ASSIGNMENTS. PILOT STUDY I. ESTABLISHMENT OF THE VALIDITY OF SELECTED DIAGNOSTIC TESTS OF PHYSICAL ABILITY OF ARMY RECRUITS. Contract DA ARO 49 092 64 G28, Tech. Rep. 1, Oct. 1965, 54pp. Applied Physiology Lab., Southern Illinois University, Carbondale, Ill. (AD 623808)

The purpose of this study was to determine whether a technique could be developed which would separate those who would be successful in a given physical task from those who would not be successful. Strength and cardiovascular tests based on pulse rates are not effective in predicting capability for a physical task where speed is the factor determining success. Failures of specific physical events in which handling the body weight is involved can be predetermined by strength standards. Cardiovascular tests can preselect those who can do a task which requires a constant rate of work for long periods of time (where speed is not a factor). (HEIAS)

R 15

27,663

Andrew, A.M. AUTOMATIC ADJUSTMENT IN A CONTINUOUS ENVIRONMENT. Contract AF AFOSR 7 64, AFOSR 65 2283, Tech. Rep. 8, Sept. 1965, 19pp. USAF Office of Scientific Research, ARDC, Washington, D.C. (Electrical Engineering Research Lab., University of Illinois, Urbana, Ill.). (AD 624548)

Control devices, biological or otherwise, which are able to adjust their own internal parameters are discussed. It is shown that under certain circumstances the adjustment process must depend on experimental fluctuations superimposed on either the parameters or the control signals. The first part of the paper reports a study of the way in which the "effective fluctuations" attributed to the parameters can best be computed from fluctuations of the control signals. The latter part of the paper is a mathematical comparison of 2 ways in which a self-improving controller may operate, namely with and without an explicit model of the environment. For a simple control task the two are shown to be almost exactly equivalent.

R 6

27,664

Altman, B. A MULTIPLE TESTING OF THE ABC METHOD AND THE DEVELOPMENT OF A SECOND-GENERATION MODEL. PART II. TEST RESULTS AND AN ANALYSIS OF "RECALL RATIO". DA 1L013001A01A, AMCHS Code: 5016,11.84400, HDL Proj. 01201, Tech. Rep. 1296, Dec. 1965, 36pp. USA Harry Diamond Labs., Washington, D.C. (AD 625924)

After a brief summary of the test program, the statistical results tabulated as overall "ABC-relevance ratios" and "ABC-recall figures" are presented and reviewed. An abstract model developed in accordance with Max Weber's "idealtypus" is used in discussing such observations as the absence of an inverse relationship of relevance and recall ratios. The increase of recall in proportion to the number of documents located is attributed to the ABC-system's peculiar capability of making the user an integral part of the system.

R 8

27,665

Berfanger, J.A. SYNTHESIZED INSTRUMENT EVALUATION. Contract AF 33(615) 2895, Proj. 6190, AFFDL TR 65 147, Sept. 1965, 20pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Link Group, General Precision Incorporated, Binghamton, N.Y.). (AD 627241)

The Photographic Instrument Synthesizer System was developed within the Simulation Facility of the Flight Dynamics Laboratory to provide an economical approach to the evaluation of new concepts in aircraft instrument design. The Synthesizer System can present these concepts in the form of a 16 mm movie and thereby reduce the need for prototype equipment. Artwork is used to represent the display elements of an instrument under consideration; several elements can be combined through multiple-exposure techniques. This report reviews the first 2 films produced with the Instrument Synthesizer; they pertain to 2 methods of displaying small changes in aircraft pitch angle. The first film concerns the feasibility of inscribing fine lines across the face of the standard Attitude Indicator to produce a strobe effect as the indicator moves through a small angle. The information gained from this film was subsequently incorporated in the design of an operational instrument. The second film was produced as a documentary film for presentation to the AIAA Conference in Dayton, Ohio; supporting scenes of the sequence of steps in the overall operation of the Synthesizer system were included to supplement the study of the small pitch angle display problems associated with an Attitude Indicator using an electroluminescent panel to replace the standard ball. Widely spaced lines on the face of the instrument were driven as a function of altitude to display the result of a change in pitch angle. This display is most effective in the portion of the instrument above its horizon reference line.

27,666

Smith, K.J., Speckmann, E.W., George, Marilyn E., Homer, G.M., et al. BIOCHEMICAL AND PHYSIOLOGICAL EVALUATION OF HUMAN SUBJECTS WEARING PRESSURE SUITS UNDER SIMULATED AEROSPACE CONDITIONS. FINAL REPORT AUGUST 1963-JUNE 1966. Proj. 7164, Task 716405, AMRL TR 65 147, Oct. 1965, 49pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (AD 626619)

A series of experiments has been designed to determine the water, energy, and protein requirements of man under various simulated aerospace conditions. The experiment described measured the effects of wearing a MA-10 pressure suit continuously for 14 days on the aforementioned measurements. A freshly prepared diet that closely matched proposed aerospace diets was fed to 4 human volunteers and coefficients of apparent digestibility and balances of the component nutrients were determined. The results showed that the wearing of unpressurized MA-10 suits under ambient conditions for 14 days did not affect the Ss<sup>1</sup> fluid intake and output. No significant changes were observed in digestibilities or balances of the nutrient components. Results indicated that the fresh food diet was very efficiently utilized. No significant changes in Ss<sup>1</sup> blood pressures, oral temperatures or pulse rates were observed during the experiment. All hematological and chemical analyses of blood were within the normal range and did not exhibit differences between experimental periods. The 2 day menu of fresh foods proved to be very acceptable and did not decrease in acceptability during the 42 day experiment.

R 29

27,667

Smith, P.F. BONE CONDUCTION, AIR CONDUCTION, AND UNDERWATER HEARING. BuMed. Work Unit MF011.99.9001.05, Memo. Rep. 65 12, Oct. 1965, 10pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 475575)

Air conduction, bone conduction and underwater hearing thresholds were measured for 8 men. Underwater thresholds agreed closely with previous studies. The loss of sensitivity for the water immersed ear with respect to sensitivity in air was found to be inversely related to air conduction thresholds indicating that underwater hearing is primarily bone conduction hearing. Some of the discrepancies in previous attempts to measure underwater thresholds may be accounted for by differences in bone conduction audiograms. It may be concluded on the basis of those results that hearing in water is primarily mediated by bone conduction. The threshold of hearing underwater is approximately 74 db re. at 500 cps. Threshold sensitivity decreases at a rate of 3 db/octave up to 8000 cps.

R 4

27,668

Junge, K. INVISIBLE LIGHT--NIGHT VISION. ONI Transl. 1047, 1965, 98pp. USN Office of the Chief of Naval Operations, ONI, Washington, D.C. (Transl: (German) IR Technology in the Military Service, Deutscher Militärverlag, 1961). (AD 277055)

This brochure presentation includes discussion on the following topics: why night vision; visible and invisible light--waves, fs, multi-colored beam, ultraviolet and infrared; how can we see--reflected and absorbed radiation, adaptation, perception of colors, perception of dimensions; illumination by infrared light--searchlights, infrared filters; seeing with infrared light--objective, image converters, eyepiece; power source--power consumption, high voltage, cables; detection devices; light propagation and reflection; tactical employment of night vision devices; and military and civilian applications of infrared rays. (HEIAS)

R 3

27,669

Sendral, V.L. THE EVOLUTION AND DEVELOPMENT OF MACHINE TRANSLATION AND INFORMATION RETRIEVAL. 1965, 30pp. (AD 477400)

This paper reviews the development of mechanized means of communicating technical information which evolved forcibly from the rapid scientific and technological advances and the ensuing information explosion. The problem of communication of this information is considered in terms of personal and structural factors, e.g., intercommunication among scientists, political and strategic factors. The need for knowledge of foreign research is indicated; translation capabilities are described. The methods of technical communication in the U.S. and Russia are compared. Federal government projects which support activities relating to retrieval, storage, and processing of scientific information and development of automatic language translation systems are described. (HEIAS)

27,670

Schroder, H.M. FACTORS UNDERLYING PERFORMANCE IN A COMPLEX DECISION MAKING TASK. PERFORMANCE IN AN ANTI-AIR WARFARE CONTEXT. FINAL REPORT. Contract Nonr 1858(42), Rep. 9, Dec. 1965, 21pp. Princeton University, Princeton, N.J. (AD 476218)

This research indicates that training in complex decision making (using here a modified AAW task) critically involves the development of higher level information processing skills. The ability to evolve and use higher level information processing procedures is relatively unrelated to the ability to take on or store information per se. Since these are independent, it becomes important to devise special training and testing procedures for decision making tasks. Such training and evaluative procedures will differ from methods devised for training in skills and in other tasks requiring the systematic application of learned rules. More effective decision making involves the ability to generate more kinds of information about an event; to develop conceptual procedures for comparing perspectives and interrelating alternate comparisons in the development of strategies. In this way, a complex environment is reduced so that it becomes manageable with a minimum loss of information. Lower levels of information processing also represent means of reducing informational complexity to a manageable form; but, in so doing, they lose more of the relevant information and have fewer ways of testing for relevance. It was concluded that training for decision making will be more effective if it is more interdependent--more inductive and discovery oriented. The problem here is to devise economically feasible methods for large scale training--a goal which has not been achieved in any branch of training or education. Research models of semi-automated inductive training methods have been devised and used in an AAW identification exercise. The parameters of the method have been studied, and it appears to achieve the goals set down for training for higher level information processing in decision making.

R 16

27,671

Rigney, J.W., Fromer, R., Langston, E.T. & Adams, H.C. EVALUATION OF AN EXPERIMENTAL FAULT LOCATION DEVICE: I. FAULT LOCATION BY RADIO OPERATORS. Contract Nonr 228(22), Proj. NR 153 093, Tech. Rep. 43, Aug. 1965, 30pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Psychology Dept., University of Southern California, Los Angeles, Calif.). (AD 474340)

An experimental fault locator (XFL) was developed for the AN/URC-32, to be used as a job-aid by shipboard personnel responsible for corrective maintenance of this transceiver. The XFL is a small, circular, plastic, job-aid which incorporates circuit-front panel relationships essential for fault localization. This report describes the XFL, and presents the results of the first of 2 evaluative studies of it. In the first study, 20 Radiomen responsible for operating the AN/URC-32 aboard their ships were taught how to check out the front panel and how to use the XFL in a 3-hour training session. Next, they were given 6 test problems to solve. They were allowed as many trials to solve each problem as they could complete in one hour. The percentage of Ss solving the problems on the first trial was quite high; this percentage increased on the second trial, and a very small percentage failed to obtain a correct solution within the one-hour time limit. M time for obtaining a correct solution of a problem on the first trial varied from 3.0 to 16.8 min, depending on the difficulty of the problem. These results demonstrate that operators, who have had minimum electronics training, can use the XFL successfully to perform fault location on the AN/URC-32 transceiver.

R 1

27,672

Rigney, J.W., Fromer, R., Langston, E.T. & Adams, H.C. EVALUATION OF AN EXPERIMENTAL FAULT LOCATION DEVICE: II. FAULT LOCATION AND ISOLATION BY EXPERIENCED ELECTRONICS TECHNICIANS. Contract Nonr 228(22), Proj. NR 153 093, Tech. Rep. 44, Sept. 1965, 21pp. USN Personnel & Training Branch, ONR, Washington, D.C. (Psychology Dept., University of Southern California, Los Angeles, Calif.). (AD 474341)

This report presents the results of the second of 2 evaluative studies on a maintenance job-aid for the AN/URC-32 transceiver. This job-aid, named the XFL, is a small, circular, plastic device which incorporates circuit-front panel relationships essential for fault localization. It is used by checking out several functions of the AN/URC-32, noting symptoms of malfunction, entering these symptoms into the XFL, and looking up the possible malfunctions in an accompanying manual. The study consisted of performance measures on an experimental group which used the XFL device and 2 control groups which did not use the device. The results clearly show that the group using the XFL is more successful than the control groups in isolating faulty components.

R 2

27,673

Newberry, P.D., Johnson, W.H. & Smiley, J.R. THE EFFECT OF HYPOXIC HYPOXIA ON NYSTAGMUS INDUCED BY ANGULAR ACCELERATION. Rep. 65 RD 5, May 1965, 12pp. Institute of Aviation Medicine, Toronto, Ontario, Canada. (AD 474851)

4 Ss were exposed to a horizontal angular acceleration of approximately  $156^\circ$  sec<sup>-2</sup> for 1 sec, while breathing air at ground level, and then while breathing air at 20,000 ft. simulated altitude. On a different day the angular acceleration was repeated while breathing 10% O<sub>2</sub> at ground level, and then while breathing air at ground level. Total slow phase angular deviation of the eye, maximum slow phase angular velocity, and total duration of nystagmus were used as criteria of the magnitude of the nystagmic response. There was a mean increase of 61% in the slow phase angular velocity of the nystagmus occurring while breathing 10% O<sub>2</sub> compared with breathing air at ground level. At 20,000 ft, however, there was a mean increase of almost 100% in total angular deviation, maximum angular velocity, and total duration of nystagmus compared to breathing either 10% O<sub>2</sub> or air at ground level. This is attributed to the obvious anxiety displayed by the Ss at 20,000 ft. It is suggested that hypoxic hypoxia and the associated hyperventilation cause a trivial increase only in the nystagmus resulting from a horizontal angular acceleration without hypoxia but that apprehension may cause a profound increase in nystagmus.

R 14

27,674

Mathis, J.V., Dickerson, T.J., Butler, C. & Mazzilli, F. THE CORRECTIVE MAINTENANCE BURDEN PREDICTION PROCEDURE, VOLUME I, TRAINING STUDY ON THE APPLICATION OF THE PROCEDURE, FINAL REPORT. Contract Nonr 3821(00), Rep. ND 65 35, June 1965, 19pp. USN New Developments Research Branch, Bureau of Naval Personnel, Washington, D.C. (Federal Electric Corporation, Paramus, N.J.). (AD 475741)

Prior to the training program discussed in this report, all applications of the Corrective Maintenance Burden (CMB) Prediction Procedure have been performed by contractor personnel, and were undertaken for the purposes of further development and refinement of the procedure. A training program was undertaken to facilitate Corrective Maintenance Burden analysis by Navy personnel by training selected staff members of the Personnel Research Laboratory (PRL) in the proper application of the CMB Prediction Procedure. The training program included a 5-day classroom training course, conducted by contractor personnel, and a practical exercise, over an approximately 4-month period, involving student application of the procedure to an electronic equipment that is presently under development by the Bureau of Ships. Concurrent but independent analysis of the same equipment by contractor personnel permitted close monitoring of the results of the student application. Details of the training program, including conclusions drawn as a result of the application of the procedure by PRL personnel, are presented in this report.

R 11

27,675

Mathis, J.V., Dickerson, T.J., Butler, C. & Mazzilli, F. THE CORRECTIVE MAINTENANCE BURDEN PREDICTION PROCEDURE, VOLUME II, TRAINING MANUAL FOR APPLICATION OF THE PROCEDURE, FINAL REPORT, Contract Nonr 3821(00), Rep. ND 65 35, June 1965, 114pp. USN New Developments Research Branch, Bureau of Naval Personnel, Washington, D.C. (Federal Electric Corporation, Paramus, N.J.). (AD 475742)

The Training Manual contained in this report is intended for use as an aid in planning and conducting a training course on the application of the Corrective Maintenance Burden (CMB) Prediction Procedure. The training course consists of 20 lessons encompassing 10 days of approximately 8 hours each. The Training manual contains a summary of training course requirements and student prerequisites; a Syllabus of Instruction; a Course Outline; a set of Lesson Plans; and a set of complete CMB analysis worksheets for the recommended equipment training vehicle. Also contained in the manual is a test of the Lesson 1 lecture (Introduction to the CMB Prediction Procedure) which can be used independently of the other lessons to indoctrinate interested parties on how the CMB Prediction Procedure is used to predict primary corrective maintenance requirements.

R 6

27,676

Montague, W.E. & Webber, C.E. EFFECTS OF KNOWLEDGE OF RESULTS AND DIFFERENTIAL MONETARY REWARD ON SIX UNINTERRUPTED HOURS OF MONITORING. Contract AF 41(609) 1481, Task 775504, SAM TR 65 62, Aug. 1965, 10pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Aviation Psychology Lab., University of Illinois, Urbana, Ill.). (Hum. Factors, April 1965, 7(2), 173-180). (AD 474470)

The effects of knowledge of results (KR) and monetary reward on 6 hrs. of uninterrupted monitoring of a complex visual display were examined. Comparisons were made among groups receiving: no KR about response adequacy, KR, KR plus monetary reward or penalty determined by response adequacy, and KR plus reward in practice but not during the criterion session. In addition, comparison was made between the no-KR group and a similar one run by Webber & Adams, where a rest had been given after 3 hrs. of a 6-hr. monitoring period. All groups showed performance decrements of small magnitude. The manipulation of KR and reward failed to deter decrement; however, reward in addition to KR did enhance overall performance. KR alone did not facilitate performance, contrary to results from other studies. Training under KR plus reward did not enhance criterion performance when no KR or reward was provided. In support of previous research, man's monitoring capabilities over extended time periods seem adequate for modern systems.

R 19

27,677  
Milan, F.A. COLD WATER TESTS OF USAF ANTI-EXPOSURE SUITS. Proj. 8238, Task 823801, AAL TR 64 31, June 1965, 32pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (AD 474349)

This report presents the results of physiological testing of some anti-exposure suits, either currently in the Air Force inventory or being considered for the inventory, as part of a "Life Saving System." The tests were carried out both in an Alaskan river with water temperatures of 0°, 2°, 7° & 12° C and air temperatures of -18°, 1°, 12° & 15° C, and in a temperature-controlled box at an air temperature of -30° C with a water temperature of 0° C. The suits tested were the R1-A, the CWU-3/P and the CWU-12/P. After being instrumented so as to obtain skin and rectal temperatures, between 6 & 8 Ss wore each of the clothing assemblies under simulated water survival conditions. The Ss jumped into cold water, then boarded and remained in an MB-4 1-man life raft for 2 hrs. or until rectal temperature fell to 35° C. The nearly linear falls of rectal temperature with time were extrapolated to 31° C, a reasonable cut-off temperature, and this time was termed "estimated survival time." By this method it was determined that the rectal temperatures of Ss dressed in the CWU-12/P in 12° C water and 15° C air would reach 31° C in 15 hrs. The severely hypothermic S would then be revived in a tank of warm water at 41° to 42° C. On the basis of these experiments, it is recommended that the Air Force substitute an insulated raft for the MB-4's currently in the inventory. Insulation in the floor and canopy of the raft will markedly increase survival time. The results of the testing program in the cold box at -30° C showed that vapor-impermeable anti-exposure suits are unsuitable for cold land survival. The suits must be removed and a down-filled arctic survival garment donned under these conditions.

R 11

27,678  
Lewis, J.W. HUMAN FACTORS EVALUATION OF THE E24 CS MUNITION. Proj. IC522301A079, CRDL Tech. Memo. 2 34, Oct. 1965, 19pp. USA Chemical Research & Development Labs., Edgewood Arsenal, Md. (AD 474350)

A human factors evaluation of the Cartridge, 40 mm, Riot Contro, CS, E24 revealed that this device can be fired by the M79 launcher and by hand. However, accuracy of the device in the hands of relatively untrained personnel is low, and is much less when fired by hand than when fired from the M79 launcher. Also, hand-firing has some degree of hazard and should not be resorted to routinely. The design of the bandolier is adequate, but quality control of pocket size is necessary. The sealing tape on the munition is difficult to remove. Training, as differentiated from orientation in the use of the device, including test firings, is needed for all personnel who will be required to use it.

27,679  
Knutson, J.G. & Kingston, K.H. AN EVALUATION OF A SUGGESTED METHOD FOR MEASURING THE EFFECTIVENESS OF THE UTILIZATION OF TECHNICALLY TRAINED PERSONNEL. M.S. Thesis. 1965, 70pp. USN Postgraduate School, Monterey, Calif. (AD 475318)

A test based on the Operations Analysis Curriculum at the United States Naval Postgraduate School was administered to 104 Naval Officers. The sub-sample, 34 examinees, consisting of officers holding Operations Analysts billets and/or Operations Analysis graduates was not sufficient to make adequate statistical determination of the measure of effectiveness proposed in a suggested methodology. The data gathered did crudely support hypothesized learning and forgetting curves and suggested that the effectiveness of Operations Analysis graduates assigned directly to Operations Analysts billets immediately after graduation is much enhanced compared to graduates who are returned first to fleet operational billets. The effectiveness of Operations Analysis trained officers in Operational Analyst billets was shown to be quantitatively and subjectively significantly superior to those with no formal Operations Analysis training. These results indicate that Naval assignment policies should be reviewed in hopes of assigning more Operations Analysis trained officers (consistent with other requirements) to these billets. Further investigation of the results of the test vehicle and other statistics common to Operations Analysis graduates yielded a feasible procedure with which to augment the screening of prospective Operations Analysis students. Final Quality Point Rating, an acceptable measure of performance, had a .614 correlation with 4 readily available statistics. This evaluation suggests that further study in this area has great promise in yielding useful measures of effectiveness for all personnel filling billets requiring postgraduate education, provided a more effective method is employed to insure completion of the required test instrument(s).

R 12

27,680  
Keenan, J.J., Parker, T.C. & Lenzycki, H.P. CONCEPTS AND PRACTICES IN THE ASSESSMENT OF HUMAN PERFORMANCE IN AIR FORCE SYSTEMS. FINAL REPORT SEPTEMBER 1964-APRIL 1965. Contract AF 33(615) 1754, Proj. 1710, Task 171006, AMRL TR 65 168, Rep. SSD 65 172(514)R, Sept. 1965, 186pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Dunlap & Associates, Incorporated, Darien, Conn.). (AD 625041)

This report describes the current practices and evaluation aspects of human performance assessment in Air Force Systems. The human performance test programs for 34 systems and sub-systems representing the major types of systems (aeronautical, electronic, missile, and space) used by the Air Force are reviewed. For these systems, the major functional areas covered include: a) Air Force policies, directives, requirements, and constraints concerning the development and assessment of system tests and human performance; b) the behavioral sciences approach to, and technology for, assessing human performance; and c) Air Force practices in assessment of human performance. Throughout, the systems context, within which human performance is conceived and evaluated, is emphasized. Consequently, the techniques within the behavioral sciences for examining human performance conceptually and empirically in the system test environment is a particularly practicable part of the report. The report is supported by many useful tables and charts, excerpts from test directives pertinent to human performance assessment, and approximately 600 categorized references.

R 595

27,681  
USAF Personal Equipment Advisory Group. MINUTES OF THE AIR FORCE (PROTECTIVE AND SURVIVAL). Report from: "Minutes of the Personal Equipment Advisory Group Meeting held 11-12 October 1965, Atlantic City, N.J.". 1965, 70pp. USAF Air Material Area, Kelly AFB, Tex. (AD 625401)

Items discussed at this meeting included the following: locator devices, lap belts, survival kits and life rafts, eye protective devices, and protective clothing. (HEIAS).



27,682

Hormann, A. DESIGNING A MACHINE PARTNER--PROSPECTS AND PROBLEMS. Contract Nonr 4745(00), Rep. SP 2169/000/01, Oct. 1965, 55pp. System Development Corporation, Santa Monica, Calif. (AD 626173)

This paper discusses some possibilities for extending man's intellectual and creative power through "partnership" with machines of increased responsiveness and sophistication. Some of the general requirements for a machine partner are stated--requirements that are likely to differ depending on the human users, their purposes, and the situations. Some of the different problem domains are discussed, and reasons are given for handling some problems by machine alone, some by a man/machine team, and still others by man alone. The paper also discusses the conceptual and technical difficulties that must be overcome before the machine can become a partner to man, rather than his simple-minded servant. The paper suggests the possibility of having "ideation sessions" with a machine partner in problem situations requiring new ideas. The machine's contribution might be greatest in the second phase of problem solving, i.e., the judicious evaluation of ideas and the selection of fruitful ones from a large volume of diverse ideas, both good and bad. Last, the paper discusses some hurdles that must be crossed before man can enjoy the benefits of machines worthy of the name "partner."

R 38.

27,683

Jeantheau, G.G., Andersen, B.G. & Yarnold, K.W. SYSTEMS ANALYSIS OF AAW TRAINING REQUIREMENTS. Contract N61339 1574, Proj. 7569 2, Tech. Rep. NAVTRADEVEN 1574 1, Nov. 1965, 72pp. USN Training Device Center, Life & Behavioral Sciences Lab., Port Washington, N.Y. (Dunlap & Associates, Incorporated, Darien, Conn.). (AD 625378)

The Training Analysis Procedure (TAP) developed under contract to USNTDC is a technique for identifying areas in system operations which provide greatest payoff in system effectiveness through training. The purpose of this study was to apply the TAP to the Navy's AAW (Anti-Air Warfare) system. This application examined 2 levels of operator performance in AAW systems as a function of method of training and time-to-train. The relative benefits to system performance of training various task groups via different training methods are shown. The results indicate that, for the levels analyzed, combined shipboard training for subsystem groups will achieve the greatest payoff in system effectiveness. Findings are cited concerning needs in existing shipboard simulation utilization and additional shipboard training equipment. Recommendations are made for further research to develop information about operator performance for different AAW system states, for research in optimum team organization, and for research to examine the need for and requirements for generalized radar training.

R 10

27,684

Jenkins, R.G. DEVELOPMENT AND EVALUATION OF AN ELECTRONIC TEST EQUIPMENT TRAINING PROGRAM. VOLUME 1. Rep. EMEC 1 65, April 1965, 72pp. USN Electronics Maintenance Engineering Center, Norfolk, Va. (AD 475790)

A recent study has indicated that shipboard enlisted personnel in the technical ratings of RD, RM, ST and ET do not possess a sufficient knowledge of the operation and application of electronic test equipment. As a result, utilization of test equipment is low and this contributes greatly to the poor state of readiness of prime equipment. In an effort to correct this situation, the Bureau of Ships assigned EMEC the task of developing and evaluating a test equipment training program. The program developed offers instruction in the operation and application of electronic test equipment, and is designed to be administered in a transportable training van. The program features a 5-day course of instruction, and is designed to be available to shipboard personnel near the piers where their ships are berthed. The test equipment training program has been evaluated by conducting actual classes with shipboard personnel in the technical ratings of ET and FT. The trainees who have participated in the training program have shown a marked improvement in their understanding of test equipment, and have demonstrated an increased ability to use the test equipment effectively. It is therefore concluded that the proposed electronic test equipment training program is an effective way to increase the ability of the technician to understand and use test equipment. This increase in ability would result in increased utilization of test equipment.

27,685

Davidson, H.D., Jr. A FEASIBILITY STUDY OF AN ESCAPE CAPSULE SYSTEM FOR HIGH-SPEED AIRCRAFT. BUWeps Probl. Assign. 1 34 33, Rep. 2126, Aero Rep. 1087, Nov. 1965, 31pp. Aerodynamics Lab., David Taylor Model Basin, Washington, D.C. (AD 475679)

Wind tunnel tests and theoretical studies were conducted to determine the feasibility of using the crew compartment of a typical airplane as an escape capsule. The stability characteristics of the separated capsule and the airplane with capsule removed were determined. In order to have a safe separation, the capsule must be forcibly ejected away from the airplane and have a stabilizing device deployed.

R 4

27,686

Borkowski, E.P. AN/SRN-9 NAVIGATION SYSTEM PRELIMINARY PERSONNEL AND TRAINING REQUIREMENTS. ND 65 41, April 1965, 28pp. USN Personnel Research Activity, Bureau of Naval Personnel, Washington, D.C. (AD 476460)

The AN/SRN-9, a compact, lightweight navigational unit that is designed to give surface vessels the capability to navigate by satellite signals, was developed by the Space Development Division of the Applied Physics Laboratory of the Johns Hopkins University. In operation, it picks up signals from orbiting navigational satellites and converts them to digital data to make the necessary computations. As the satellite passes overhead the operator tunes the receiver to the satellite frequency. When the signal is acquired the receiver locks on and the equipment works automatically throughout the satellite pass. The AN/SRN-9 prints out on tape orbital data, doppler frequency, and precise time derived from the satellite's signal. The taped information is then fed into the shipboard computer and an accurate fix can be obtained within 3 min. or less. Selection criteria for Electronic Technicians (ETN) designated to receive factory training should include training or experience on digital computers. Investigations should be conducted to: determine the number and the location of training facilities required to support this program; determine if a Naval Enlisted Classification Code should be established to identify personnel trained in the operation and maintenance of this equipment.

R 3

27,687

Andreassi, J.L. & Cavallari, J.D. BIOPOTENTIAL SIGNALS AS A FUNCTION OF LEARNING TASK DIFFICULTY. Proj. 7885 7, NAVTRADEVCEV 1H 34, Aug. 1965, 30pp. USN Training Device Center, Port Washington, N.Y. (AD 625130)

The present study is concerned with biopotential responses to a learning situation in which the difficulty of materials was systematically varied. In Exp. I 8 Navy enlisted men learned 3 lists of nonsense syllables (0%, 53% and 100% association value), while heart rate (HR), palmar skin conductance (PSC), galvanic skin responses (GSRs), and muscle action potentials (MAPs) were monitored continuously. Ss reported for one-hour sessions on each of 3 successive days. Resting levels of all biopotential signals were taken at regular intervals in each of the experimental sessions. Exp. II was conducted in the same manner with 8 college students as Ss. The results showed that: a) the Navy men had statistically significant increases in both PSC and HR with the easy and moderate lists as compared with the most difficult list; b) there were increases in all of the biopotential measures during learning as compared to the resting conditions; c) the college students had non-significant increases in HR as a function of ease of list. The results for the Navy Ss were interpreted in terms of motivational factors. It was suggested that the discrepancy in results for the 2 groups may have been due to educational and age factors. Some possible applications of the experimental findings were suggested in addition to some indications as to the direction of future research in this area.

R 8

27,688

Lowin, A. & Epstein, Gilda F. DOES EXPECTANCY DETERMINE PERFORMANCE? J. exp. Soc. Psychol., Aug. 1965, 1(3), 248-255. (Columbia University, New York, N.Y.).

Aronson and Carlsmith (1962) indicated that Ss preferred to fail and confirm a failure expectancy than to be successful and disconfirm the expectancy. An attempted replication reported here, Exp. I, did not support these findings. Instead, Ss appeared achievement oriented. An alternative explanation of the Aronson and Carlsmith data, that of experimenter demand, was rejected by a second study, in which experimenter status and payment were manipulated. Exp. III investigated a differential recall interpretation of the Aronson and Carlsmith results. Some recall differences were found. Correcting our initial data for recall, the achievement interpretation appeared strengthened. However, similarly correcting the Aronson and Carlsmith data strengthens their expectancy analysis. It is suggested that, in the present studies, strong achievement motives may be suppressing expectancy effects. Therefore, no definitive refutation of expectancy theory is claimed.

R 6

27,689

Broadbent, D.E. TECHNIQUES IN THE STUDY OF SHORT TERM MEMORY. Acta Psychol., July 1965, 24(3), 220-233. (Applied Psychology Research Unit, MRC, Cambridge, England).

The techniques described--use of predictable intervening activity, use of unpredictable stimuli during retention, use of other learning as intervening activity--are in most cases simple to apply, and capable of yielding considerably more information than do orthodox tests of memory span or of the ability to reproduce some material which has been presented straightforwardly and without any intervening or interfering activity. It is extremely probable that clinical conditions which result in defects of memory may show themselves in some of these tasks although remaining difficult to detect with more traditional techniques; this was shown in the case of age. Any such dissociation between effects on these tasks and on straightforward memory spans, or between one of these tasks and another, will assist in more adequate theoretical understanding of short term memory. It is to be hoped, therefore, that these techniques will be applied more widely than has thus far been possible.

R 32

27,690

Kay, H. ONE TRIAL LEARNING: INCREMENTAL OR ALL-OR-NONE? Acta Psychol., July 1965, 24(3), 234-243. (Psychology Dept., University of Sheffield, Sheffield, England).

This discussion follows 2 lines of enquiry: "what actually is now meant by psychologists when they talk about incremental and all-or-none learning; and what methods have been, or could be, followed to investigate these theories." Under the first line, 2 analogies are proposed--the dripping tap model and the post office relay model--to put the differences between the theories in an extreme form so distinctions will not be blurred. It is seen that the former model is almost too flexible to be useful for it postulates neither a rate of increase or decay whereas the relay model will not cater for over-learning. The methods considered are drop out and one-learning trial. Finally, the studies of short term retention are applied to the issue.

R 11

27,691

Conrad, R. THE ROLE OF THE NATURE OF THE MATERIAL IN VERBAL LEARNING. Acta Psychol., July 1965, 24(3), 244-252. (Applied Psychology Research Unit, MRC, Cambridge, England).

It is clear that there are many pitfalls to be avoided in constructing material for verbal learning experiments. These have been discussed mainly for the case of short term recall of letters because the material is sufficiently simple that the known rules can be applied. At least tables are now available which permit measurement of predictability and acoustic confusability of letters. But the same hazards are present with digits; the British emergency telephone number is 999, which is highly predictable, has zero within-sequence acoustic confusability and has a highly structured repetition pattern. But apart from the repetition factor, the effects are likely to be weaker. If words are used, interpretations of results will require great care indeed. If experimental results in verbal learning fail to confirm a reasonable prediction, before abandoning the prediction, it would be wise to double check that the main effects are not confounded with effects due to the nature of the material.

R 14

27,692

Moray, N. & Barnett, T. STIMULUS PRESENTATION AND METHODS OF SCORING IN SHORT-TERM MEMORY EXPERIMENTS. Acta Psychol., July 1965, 24(3), 253-263. (Psychology Dept., University of Sheffield, Sheffield, England).

The transmission through channels distinguished by the physical characteristics of a voice has limitations similar to those due to spatial separation. By examining different kinds of error score, omissions, order errors, commissions, etc., we can study mechanisms more clearly. By altering presentation rate, transmission strategy and the size of stimulus ensemble, we can manipulate these different mechanisms to some degree independently one of another. An important example of this last factor is the one of stimuli where the whole ensemble is present on each trial, so that there is a very straightforward sense no ambiguity about content but only about order.

R 6

27,693  
Neisser, U. & Beller, H.K. SEARCHING THROUGH WORD LISTS. *Brit. J. Psychol.*, Nov. 1965, 56(4), 349-358. (Brandeis University, Waltham, Mass.).

2 experiments are reported in which Ss searched through lists of words, looking for targets defined only in terms of their meaning (e.g. 'any animal'). Under these conditions, scanning is much slower than when the target is a known word, or a member of a small fixed set. It is argued that printed words are processed in 2 stages, termed 'stimulus examination' and 'memory examination' respectively. Preliminary data relevant to other aspects of the scanning method are also presented: error rates, the importance of motivation, the extent to which words scanned over can be recognized later, and the relation between scanning and reading aloud.

R 5

27,694  
Neisser, U. & Stoper, A. REDIRECTING THE SEARCH PROCESS. *Brit. J. Psychol.*, Nov. 1965, 56(4), 359-368. (Brandeis University, Waltham, Mass.).

Ss scanned through lists of words looking for proper names. Some lists contained cue words which made it possible to skip a number of lines. 1 or 2 sec. were needed to make such a skip; hence cues for short skips were not used. Interpretation is in terms of a higher-order process which controls the scanning pattern.

R 5

27,695  
Treisman, Anne M. THE EFFECTS OF REDUNDANCY AND FAMILIARITY ON TRANSLATING AND REPEATING BACK A FOREIGN AND A NATIVE LANGUAGE. *Brit. J. Psychol.*, Nov. 1965, 56(4), 369-379. (Institute of Experimental Psychology, University of Oxford, Oxford, England).

The experiment explored the effect of sequential constraints on 2 speech transmission tasks: a) 'shadowing' or repeating back passages in a native and in a foreign language; b) simultaneous translation between a foreign and a native language. 3 factors affecting performance were revealed: a) efficiency decreased in both tasks with increased information rate in the presentation of the passages; b) the familiarity of the language affected Ss' performance in shadowing; this effect was independent of sequential constraints; c) translation proved more difficult than shadowing, but in this case the decrement was greater the higher the information content of the passages. This suggested: a) that sequential constraints are important in facilitating both types of speech transmission; b) that they are learnt concurrently with vocabulary in the acquisition of a foreign language; c) that translating is more difficult than shadowing not only because of decreased familiarity of either input or output, but also because of the increased decision load imposed by the more complex transformation between input and output. The roles of grammatical and semantic constraints were separated by the use of passages with words chosen at random but syntax conforming to normal rules. Performance with these passages was intermediate between that with normal prose and that with random words; the grammatical constraints seemed relatively more important than constraints of meaning in shadowing than in translating, in a native than in a foreign language, and in French than in English. The ear-voice span was measured for 6 Ss and was found to be greater for translating than for shadowing, but to be unaffected by the degree of sequential constraints.

R 10

27,696  
Murdock, B.B., Jr. EFFECTS OF A SUBSIDIARY TASK ON SHORT-TERM MEMORY. *Brit. J. Psychol.*, Nov. 1965, 56(4), 413-419. (Psychology Dept., University of Missouri, Columbia, Mo.).

If there is a limited-capacity mechanism in STM then introducing a concurrent subsidiary task should adversely affect recall. 2 experiments on free recall were conducted with card sorting as the subsidiary task. In the first experiment Ss dealt cards into 1 pile, into 2 piles by colour, or into 4 piles by suit while lists of common English words were being read. Ss sorted cards only during presentation of the lists. As the subsidiary task became more demanding the N words correctly recalled decreased. In the second experiment sorting by suit was combined with free recall, and the payoffs (relative importance of the 2 tasks) were varied. Performance on both the recall and the card sorting tasks deteriorated as the other task was stressed. Differences in recall could not easily be attributed to differences in original learning, and the results suggested that the subsidiary task interfered with rehearsal and/or decreased total presentation time for free recall.

R 11

27,697  
Corteen, R.S. & Blackman, A.R. SKIN CONDUCTANCE CHANGE AND SENSORY DISCRIMINATION. *Brit. J. Psychol.*, Nov. 1965, 56(4), 431-437. (Psychology Dept., University of Edinburgh, Edinburgh, Scotland).

The relation between M log. change in conductance and sensory discrimination was investigated. Highly significant relations were found with CFF and 2-point tactile thresholds. No significant relation was found with discrimination of a pure tone from background white noise. An attempt at explanation is offered in terms of a cortically controlled centre mediating a sensitizing or orienting response of which conductance change is a peripheral manifestation.

R 17

27,698  
McFarland, J.H. SEQUENTIAL PART PRESENTATION: A METHOD OF STUDYING VISUAL FORM PERCEPTION. *Brit. J. Psychol.*, Nov. 1965, 56(4), 439-446. (Worcester Foundation for Experimental Biology, Shrewsbury, Mass.).

Everyday perception of a form's parts as simultaneous and joined is viewed as a perceptual achievement dependent on the central operations of analysis and integration. Experiments have been conducted which employ a method of stimulus presentation which assures that neural response simulates the hypothesized analysis operation, viz. sequential part presentation. Perceptual measures are employed which are assumed to reflect the hypothesized integration. In one experiment, interpart intervals between the sequentially presented sides of a line triangle were varied and 50% points determined for judgements of simultaneity and joining between the lines. In a second experiment, these thresholds were also determined, but for side part vs. angle part presentation of the line triangle. With side part presentation, thresholds for both judgements of simultaneity and joining were found to be higher. It is concluded that normal perception of form, i.e., perception of parts as simultaneous and joined, can take place at larger intervals when sequential response is to side parts.

R 26

27,699

Warrington, Elizabeth K. THE EFFECT OF STIMULUS CONFIGURATION ON THE INCIDENCE OF THE COMPLETION PHENOMENON. Brit. J. Psychol., Nov. 1965, 56(4), 447-454. (The National Hospital, London, England).

The phenomenon of 'completion' of incomplete figures across hemianopic field defects was studied in relation to the nature of the stimulus forms used. While the highest incidence of complete responses occurred with simple geometrical forms a substantial number occurred also in response to other types of forms, including complex representational material characterized neither by symmetry, nor 'goodness' in the Gestalt sense, but depicting objects which are familiar and readily named. It was concluded that completion responses are most readily given to those forms with which the patient is familiar and which he would expect to see in complete form. Unfamiliar forms not readily named are infrequently completed.

R 7

27,700

Bevegard, B.S. & Shepherd, J.T. CHANGES IN TONE OF LIMB VEINS DURING SUPINE EXERCISE. J. appl. Physiol., Jan. 1965, 20(1), 1-8. (Physiology Sect., Mayo Clinic & Mayo Foundation, Rochester, Minn.).

Normal Ss have been studied to assess the response of the capacitance vessels in the forearm during supine leg exercise. Measurements were made of changes in forearm volume (strain-gauge and water-filled plethysmographs) at a given pressure in the large forearm veins, of changes in pressure in the forearm veins with the circulation to the forearm arrested and in "isolated" vein segments. The results were consistent and demonstrated that exercise with a work load of 270-810 kg/min caused constriction of forearm capacitance vessels via the sympathetic nerves proportional to the severity of the exercise. Venospasm also occurred in the hand, and in the calf during arm exercise. Local exercise of the forearm muscles during supine leg exercise, which increased forearm blood flow by dilating the resistance vessels, did not prevent the increase in venous tone in the forearm. Thus a reflex increase in tone in the limb veins, both in the exercising and in the nonexercising parts, contributes to the cardiovascular adaptation to exercise.

R 28

27,701

Dill, D.B. OXYGEN USED IN HORIZONTAL AND GRADE WALKING AND RUNNING ON THE TREADMILL. J. appl. Physiol., Jan. 1965, 20(1), 19-22. (Anatomy & Physiology Depts., Indiana University, Bloomington, Ind.).

The net oxygen cost of level and grade running was determined in 3 men--the author and 2 champion runners. The horizontal costs for the 3 were in agreement at the lower rates and for the 2 runners at high rates. A curve enables one to estimate the cost of horizontal walking and running and also of the horizontal component of grade walking and running. With this as a basis the cost of the vertical component in grade walking was found to be 1.53 ml/m.kg for one of the runners in both walking and running. This latter value and the curve relating the cost of the horizontal component to the rate of walking and running were used to estimate the cost of grade walking and running for 7 other champion runners. The estimates checked closely with the observed cost in 5. Marathoner DeMar was more efficient and the seventh runner was less efficient than predicted.

R 15

27,702

Wyndham, C.H. ROLE OF SKIN AND OF CORE TEMPERATURES IN MAN'S TEMPERATURE REGULATION. J. appl. Physiol., Jan. 1965, 20(1), 31-36. (Human Science Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

The response characteristics have been studied of the curves relating heat conductance and sweat rate to change in rectal temperature at different levels of skin temperature, and vice versa. The increase in these responses with deviation in rectal temperature from the "neutral" setting is highly nonlinear; the neutral point and the curve shift to the right and the slope decreases with lowering of skin temperature and vice versa when it is raised. With further deviation of rectal temperature these responses reach maximum values, i.e., become "saturated." All of these features are analogous to servomechanisms with negative feedback, giving sensitive and stable control. Control of these responses by skin temperature is more linear, characterizing passive control systems which are insensitive and less stable. Quantitatively, the effect at skin temperature of 26 C of 1 C rise in rectal temperature on heat conductance and sweat rate is 10 times greater than the same rise in skin temperature; at a neutral skin temperature of 33-34 C, a rise of 1 C in rectal temperature is 6-7 times greater; at a high skin temperature of 36 C, a rise in rectal temperature of 1 C is 4-5 times greater.

R 17

27,703

Wyndham, C.H., Strydom, N.B., Morrison, J.F., Williams, C.G., et al. CRITERIA FOR PHYSIOLOGICAL LIMITS FOR WORK IN HEAT. J. appl. Physiol., Jan. 1965, 20(1), 37-45. (Human Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

New physiological criteria are put forward for setting the limits for men at work in hot conditions. They are based upon the fact that the curves relating rectal temperatures to conductances and rectal temperatures to sweat rates have 2 components. One is where the increases in the sweat rates and conductances, with rise in rectal temperature, are relatively large, i.e., there is a "sensitive" range of control; the second is where the curves of sweat rates and conductances against rectal temperatures reach asymptotes, i.e., become "saturated." The upper limit of the sensitive range is a rectal temperature of 100.5 F (38.1 C), and the saturated range begins at rectal temperatures of 102.5 F (39.4 C). These concepts explain the "easy," "difficult," or "excessive" ranges of conditions of the Fort Knox and Human Sciences Laboratory studies. The great advantage of these criteria over others proposed is that the extent of the physiological strain on the workmen can be assessed, directly and simply, by a measurement of oral or rectal temperatures during the shift, and from these results limits for work can be set for work at specific hot jobs.

R 16

27,704

Lee, D.Y., Hong, S.K., & Lee, P.H. PHYSICAL INSULATION OF HEALTHY MEN AND WOMEN OVER 60 YEARS. *J. appl. Physiol.*, Jan. 1965, 20(1), 51-55. (Physiology Dept., Yonsei University College of Medicine, Seoul, Korea).

Maximal body insulation  $I = (\text{rectal temp.} - \text{skin temp.}) / \text{rate of skin heat loss}$  of healthy Korean men and women (17 each) over 60 years of age was determined by a method applied earlier to diving women of Korea (Rennie et al. *J. Appl. Physiol.* 17:961, 1962). The critical water temperature was similar for males and females, ranging for 28-33 C. The water temperature at which 50% of Ss shivered was 31.2 C for both groups. This value is identical to that of young Korean men but is significantly higher than that of young Korean women. When a comparison was made at 31 C water, the extent of reduction in rectal temperature was, in the aged group, greater in males than in females, and was also greater in the aged than in the young. However, these differences could be accounted for mostly by the difference in subcutaneous fat thickness. When the values of  $I$  were considered as a function of the subcutaneous fat thickness, there was no difference either between old males and females or between the aged and young Korean Ss. This indicates that maximal body insulation due to physical factors does not change as a function of age.

R 9

27,705

Hanson, P.G. & Johnson, R.E. VARIATION OF PLASMA KETONES AND FREE FATTY ACIDS DURING ACUTE COLD EXPOSURE IN MAN. *J. appl. Physiol.*, Jan. 1965, 20(1), 56-60. (Physiology & Biophysics Depts., University of Illinois, Urbana, Ill.).

We have studied the magnitude of ketosis induced during acute cold exposure. Plasma and urinary ketone bodies and plasma free fatty acids (FFA) were followed in 4 healthy young men at rest during a 90-min period of seminude exposure to 0 C in still air. This period was followed by 4 hr of recovery at 25 C. Each S served as his own control throughout an experimental sequence in which one cold-exposure and corresponding control period (25 C) were experienced each week for 3 successive weeks. The Ss were in a fasting state but with water ad libitum beginning 12 hr prior to the experiment. Light weight clothing was worn during recovery and control periods. The combined group data show a significant increase in plasma FFA during cold exposure as compared with similar control periods. Although true hyperketonemia or hyperketonuria did not develop, the levels of plasma ketones are elevated in the cold-exposure period of the first week. During the second and third week there is no difference between the cold and control plasma ketone concentration. The data suggest that FFA is mobilized as a metabolic substrate during cold exposure and that efficient peripheral utilization of the elevated plasma FFA concentration minimizes hyperketogenesis.

R 28

27,706

Hsieh, A.C.L., Nagasaka, T. & Carlson, L.D. EFFECTS OF IMMERSION OF THE HAND IN COLD WATER ON DIGITAL BLOOD FLOW. *J. appl. Physiol.*, Jan. 1965, 20(1), 61-64. (Physiology & Biophysics Depts., University of Kentucky, Lexington, Ky.).

The temperatures of the tip of the middle fingers ( $T_f$ ) of 9 comfortably warm Ss have been recorded during immersion of all the fingers of one hand in a 27-liter bath containing slowly stirred water at temperatures ranging from 4.6 to 40 C ( $T_w$ ). Blood flow ( $F = \text{ml/cm}^2$  per min) was estimated from the average  $T_s$  for the last 15 min of a 20-min period,  $T_w$  and body temperature ( $T_b$ ) by using the equation:  $F = 1.087 \times K(T_s - T_w) / (T_b - T_s)$ . ( $K = 0.0134 \text{ kcal/cm}^2 \text{ per min per } ^\circ\text{C}$ .) The increase in  $F$  per  $^\circ\text{C}$  reduction in  $T_w$  below 10 C was  $0.16 \pm 0.077$  ( $P < .05$ ). This value gives a measure of the vasodilatation occasioned by immersion in water below 10 C. The sample regression equation of  $F$  on  $T_w$  was:  $F = 4.1 - .16 T_w \pm 0.17$  ( $n = 27$ ; range of  $T_w = 4.6$  to  $10$  C). This method of estimating blood flow at several levels of  $T_w$  describes more fully the peripheral circulatory response to cold than methods in which only one level of  $T_w$  is used.

R 13

27,707

Keatinge, W.R. & Nadel, J.A. IMMEDIATE RESPIRATORY RESPONSE TO SUDDEN COOLING OF THE SKIN. *J. appl. Physiol.*, Jan. 1965, 20(1), 65-69. (Cardiovascular Research Institute, University of California School of Medicine, San Francisco, Calif.).

Showers at 25 C and below increased ventilation in man and respiration often could not be controlled voluntarily during showers at near 0 C. The increase took place within seconds and was accompanied by an increase in arterial  $pO_2$ . The response could be obtained from high decerebrate cats and is believed to be a reflex initiated by cold receptors in the skin and mediated at midbrain level. The chest and abdomen were the most sensitive areas in man, but chilling any large area on the trunk or limbs caused some increase in ventilation. Although the showers caused an inspiratory shift in respiration and a sensation of difficulty in breathing, they caused little increase in airway resistance and no decrease in pulmonary compliance.

R 18

27,708

Bass, D.E. & Jacobson, E.O. EFFECTS OF SALICYLATE ON ACCLIMATIZATION TO WORK IN THE HEAT. *J. appl. Physiol.*, Jan. 1965, 20(1), 70-72. (USA Research Institute of Environmental Medicine, Natick, Mass.).

Some effects of daily large doses of sodium salicylate were studied on the pattern of acclimatization to work in the heat. Acclimatization was induced by daily walks of 100 min on a level treadmill at 3.5 mph at 120/80 F (dry bulb/wet bulb). 2 matched groups of 6 men each were acclimatized in this manner and one group received 5.9-7.8 g of sodium salicylate daily over a period of 10 days. Men treated with salicylate exhibited the same qualitative responses as the control group in terms of the acclimatization process, i.e., their rectal temperatures, skin temperatures, and pulse rates during work in the heat were lower on the later days. Quantitatively, the degree of acclimatization (as measured by rectal temperature) was less in the men receiving salicylate than in the control group. This difference was more apparent than real, however, in that when the salicylate group were taken off the drug regimen, they exhibited the same degree of acclimatization in terms of rectal temperature as did the control group. The acclimatization process did not abolish the acute response to salicylate.

R 4

27,709

Iampietro, P.F. & Goldman, R.F. TOLERANCE OF MEN WORKING IN HOT, HUMID ENVIRONMENTS. J. appl. Physiol., Jan. 1965, 20(1), 73-76. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla. & USA Quartermaster Research & Engineering Center, Natick, Mass.).

Tolerance of acclimatized men working in 8 hot, humid environments was studied. Results show that the upper limits for completion of 3 hr of work at a caloric expenditure of 350 kcal/hr are dry bulb (DB) 95 F and wet bulb (WB) 90 F. Rectal temperature is not a good indicator of tolerance under the conditions of our study, while skin temperature and heart rate are. A good relationship is evident between the rapid changes in skin temperature during work (first 10 min of exposure) and tolerance time; thus, these rapid changes may be used to predict tolerance time. Of the physical indexes of thermal stress the best relationship was established between WD ( $WD = 0.15 DB$  and  $0.85 WB$ ) and tolerance time.

R 11

27,710

Orzalesi, M.M., Hart, M.C. & Cook, C.D. DISTRIBUTION OF VENTILATION IN NORMAL SUBJECTS FROM 7 TO 45 YEARS OF AGE. J. appl. Physiol., Jan. 1965, 20(1), 77-78. (Pediatrics Dept., Harvard Medical School, Boston, Mass.).

Distribution of ventilation was investigated in 57 normal Ss of both sexes ranging in age from 7 to 45 years using the nitrogen washout method. Normal values for nitrogen clearance delay and the lung clearance index are presented for children and adults. No significant sex- or age-dependent difference was found in either of these parameters. The present data are compared with those in the literature.

R 7

27,711

Albert, R.E. SWEAT SUPPRESSION BY FORCED BREATHING IN MAN. J. appl. Physiol., Jan. 1965, 20(1), 134-136. (USA Research Lab., Fort Knox, Ky.).

Thermal sweating from the forehead was suppressed by forced air breathing in 2 normal male Ss. The decreased sweat rate was associated with symptoms of respiratory alkalosis. This sweat suppression was blocked by the introduction of excess carbon dioxide into the respired gas.

R 3

27,712

Grimby, G. RENAL CLEARANCES AT REST AND DURING PHYSICAL EXERCISE AFTER INJECTION OF BACTERIAL PYROGEN. J. appl. Physiol., Jan. 1965, 20(1), 137-141. (Clinical Physiology Dept., University of Goteborg, Goteburg, Sweden).

Clearance of inulin ( $C_{IN}$ ) and para-aminohippuric acid ( $C_{PAH}$ ), cardiac output, oxygen uptake, and arterial blood pressure were measured in 5 healthy Ss at rest and during supine exercise on a bicycle ergometer before and after injection of a bacterial pyrogen (purified lipopolysaccharide, Pyrexal).  $C_{PAH}$  was 45-145% higher at rest during the flush phase than in the normal condition. The increase in  $C_{IN}$  was less. Cardiac output increased also. The renal fraction of the cardiac output was larger than in the normal condition. During moderate exercise in the flush phase,  $C_{PAH}$  decreased from the values before work. This decrease was usually larger than in the normal condition. The pyrogen-induced increase in cardiac output was less during exercise than at rest. A pronounced renal vasoconstriction during exercise is demonstrated even after the injection of bacterial pyrogen.

R 22

27,713

Tabakin, B.S. & Hanson, J.S. LUNG VOLUME AND VENTILATORY RESPONSE TO AIRWAY OBSTRUCTION DURING TREADMILL EXERCISE. J. appl. Physiol., Jan. 1965, 20(1), 168-170. (Cardiopulmonary Lab., University of Vermont College of Medicine, Burlington, Bt.).

Measurement of lung volumes and certain ventilatory variables during treadmill exercise with a 5-mm expiratory airway obstruction revealed significant changes in residual volume, expiratory reserve volume, and lung clearance index as compared to values obtained without obstruction. These variations in themselves do not explain previously observed large decrements in oxygen utilization with acute airway obstruction. However, the additive effects of decreased alveolar ventilation and alterations in intrapulmonary gas distribution could account for this phenomenon.

R 7

27,714

Anthonisen, N.R., Bartlett, D., Jr. & Tenney, S.M. POSTURAL EFFECT ON VENTILATORY CONTROL. J. appl. Physiol., March 1965, 20(2), 191-196. (Physiology Dept., Dartmouth Medical School, Hanover, N.H.).

Minute ventilation, alveolar  $CO_2$  tension ( $P_{ACO_2}$ ), and arterial  $CO_2$  tension ( $P_{aCO_2}$ ) were studied in human Ss during passive tilt from the supine to the erect position. These measurements showed that the erect position was associated with relative alveolar hyperventilation. The hyperventilation of the erect position was found to be almost entirely reversible if hydrostatic effects were removed by water immersion to the level of the xiphoid. Postural changes in ventilation correlated with circulatory changes, suggesting a causal relationship. However, the possibility of a gravity-sensitive abdominal receptor which influences ventilation was not eliminated.

R 24

27,715

White, R.I., Jr. & Alexander, J.K. BODY OXYGEN CONSUMPTION AND PULMONARY VENTILATION IN OBESSE SUBJECTS. J. appl. Physiol., March 1965, 20(2), 197-201. (Medicine Dept., Baylor University College of Medicine, Houston, Tex.).

Postabsorptive body oxygen consumption ( $\dot{V}O_2$ ) and pulmonary minute ventilation ( $\dot{V}_E$ ) were measured 164 times in 109 very obese Ss at rest. A statistically significant relationship was found between  $\dot{V}O_2$  and total body weight. The correlation coefficients for the relationships between  $\dot{V}_E$  and total body weight and  $\dot{V}_E$  and body surface area were less significant. The mean calculated basal metabolic rate was within normal limits. The mean values for  $\dot{V}O_2$  in the obese Ss were considerable higher than those predicted at ideal weight, while the mean values for oxygen consumption per kg body weight were lower than those reported in normal Ss. The mean percentage increase in oxygen consumption per kg excess weight ( $\Delta\dot{V}O_2/\Delta kg$ ) approached the value for percentage of cell mass in excess weight, suggesting that  $\Delta\dot{V}O_2/\Delta kg$  may be a function of the increment in cell mass with obesity. Similarly, since basal metabolic rate remained unchanged, proportionate increments in body surface area and cell mass appeared to occur with the development of obesity.

R 25

27,716

Hultgren, H.N., Kelly, J. & Miller, H. PULMONARY CIRCULATION IN ACCLIMATIZED MAN AT HIGH ALTITUDE. *J. appl. Physiol.*, March 1965, 20(2), 233-238. (Cardiology Div., Stanford University School of Medicine, Palo Alto, Calif.).

Cardiac catheterization studies have been carried out in 30 acclimatized adults at an altitude of 12,300 ft in the Peruvian Andes. Mean pulmonary artery pressure was 22 mm. Hg (range 14-31 mm Hg) compared to 15 mm Hg (range 11-17 mm Hg) observed in sea-level Ss. The pulmonary artery wedge pressure was normal and calculated pulmonary arteriolar resistance was increased by 180% over sea-level values. The arteriovenous oxygen content difference and oxygen consumption were slightly greater at high altitude, but the cardiac output was normal. There was no relationship between hematocrit and pulmonary artery pressure or resistance, suggesting that in the high-altitude resident, blood viscosity in a hematocrit range of 40-78% does not significantly affect resistance to blood flow. 9 Ss studied at 14,200 ft had the same mean pulmonary artery pressure (22 mm Hg, range 17-32 mm Hg) as the larger group at 12,300 ft.

R 29

27,717

Hultgren, H.N., Kelly, J. & Miller, H. EFFECT OF OXYGEN UPON PULMONARY CIRCULATION IN ACCLIMATIZED MAN AT HIGH ALTITUDE. *J. appl. Physiol.*, March 1965, 20(2), 239-243. (Cardiology Div., Stanford University School of Medicine, Palo Alto, Calif.).

The response to breathing 100% oxygen was studied in 26 acclimatized residents of the Peruvian Andes at altitudes of 12,300 and 14,200 ft. Arterial oxygen saturation increased from 86% to 96%. Mean pulmonary artery pressure decreased by 5 mm Hg and cardiac output did not change. Calculated pulmonary arteriolar resistance was lowered. Pulmonary artery pressure during oxygen breathing was not decreased to normal values observed at sea level. The data suggest the presence of 2 factors responsible for the increase in pulmonary arteriolar resistance at high altitude: a) hypoxic vasoconstriction which is reversed by oxygen breathing and b) anatomic alterations which are not affected by oxygen breathing. Oxygen breathing at high altitude also produced a slowing of the heart rate and increased the relative height of the secondary or tidal wave of the brachial arterial pressure pulse.

R 18

27,718

Lamb, T.W., Anthonisen, N.R. & Tenney, S.M. CONTROLLED FREQUENCY BREATHING DURING MUSCULAR EXERCISE. *J. appl. Physiol.*, March 1965, 20(2), 244-248. (Physiology Dept., Dartmouth Medical School, Hanover, N.H.).

3 human Ss exercised at 2 and 4 mph on a treadmill while breathing room air and 100% oxygen. Respiratory frequency was voluntarily controlled at 6, 12, & 24 breaths/min so that the only ventilatory response possible was a change in tidal volume. Mean  $\text{CO}_2$  tension of arterialized venous blood was maintained constant near the resting value by each S under all experimental conditions, including oxygen breathing with the exception of 1 S who hyperventilated at 2 mph while breathing 24 times/min. Oscillations in alveolar and arterial  $\text{P}_{\text{CO}_2}$  within each respiratory cycle were markedly altered by respiratory frequency and the intensity of exercise. No relationship was found between  $\dot{V}_E$ ,  $\dot{V}_A$ ,  $\dot{V}_r$ , and the amplitude of oscillation or the rate of change of arterial  $\text{P}_{\text{CO}_2}$  or  $\text{PO}_2$ . Varying levels of the work of breathing were observed while the arterial  $\text{P}_{\text{CO}_2}$  remained constant. It is concluded that the oscillations in arterial  $\text{P}_{\text{CO}_2}$  and  $\text{PO}_2$  which are observed at rest and during muscular exercise are associated phenomena, not controlling stimuli.

R 11

27,719

Astrand, P.-O., Ekblom, B., Messin, R., Saltin, B., et al. INTRA-ARTERIAL BLOOD PRESSURE DURING EXERCISE WITH DIFFERENT MUSCLE GROUPS. *J. appl. Physiol.*, March 1965, 20(2), 253-256. (Physiology Dept., Kungliga Gymnastiska Centralinstitutet, Stockholm, Sweden).

In 13 Ss intra-arterial blood pressure, heart rate, blood lactate, oxygen consumption, and pulmonary ventilation were respectively measured during submaximal and maximal arm and leg exercise. Blood pressure usually increased linearly with the oxygen uptake, this increase being significantly more pronounced for arm than leg work. The site of the catheter, mostly the femoral artery, can partly account for the difference, recorded blood pressure being constantly higher in the resting limb. Nevertheless, simultaneously recorded pressures in arm and leg give significantly higher values during cranking. Larger increases in peripheral vascular resistance in the resting extremities during arm work as well as the important static work produced by cranking are possible explanations for this difference. This fact might have clinical interest.

R 16

27,720

Krumholz, R.A. & Ross, J.C. SECONDARY VENTILATORY RESPONSE TO EXERCISE: MODIFICATION BY AGENTS WHICH ALTER CBF. *J. appl. Physiol.*, March 1965, 20(2), 257-262. (Heart Research Center, Indiana University School of Medicine, Indianapolis, Ind.).

Ventilation increases at the onset of exercise. Another abrupt increase, the secondary ventilatory response, occurs later. This study gives further observations on the secondary ventilatory response and its modification by  $\text{O}_2$  breathing and other agents which alter cerebral blood flow. The secondary ventilatory response is similar to the response which follows release of arterial tourniquets inflated on the thighs, which is delayed in time of onset by  $\text{O}_2$  breathing and infusion of aminophylline and  $\text{NH}_4\text{Cl}$  and accelerated by  $\text{CO}_2$  breathing and  $\text{NaHCO}_3$  infusion. This suggested that the respiratory center response may, to some extent, be dependent upon cerebral blood flow. The onset of the secondary ventilatory response was delayed by 100%  $\text{O}_2$  breathing. Infusion of  $\text{NH}_4\text{Cl}$  significantly delayed the onset of the secondary rise and  $\text{NaHCO}_3$  tended to make it come sooner. The timing of the secondary ventilatory response, then, was changed by substances which alter cerebral blood flow. It is suggested that the secondary ventilatory response may be due to a blood-borne substance released from working muscles.

R 17

27,721

Michael, E.D., Jr. & Horvath, S.M. PHYSICAL WORK CAPACITY OF COLLEGE WOMEN. *J. appl. Physiol.*, March 1965, 20(2), 263-266. (Environmental Stress Lab., University of California, Santa Barbara, Calif.).

Maximal exercise tolerance tests were given to 30 female Ss 17-22 yrs old. The test consisted of exercising 1 min at a work load of 300 kpm/min and increasing the work load 150 kpm/min each minute until the S could no longer exercise. The maximal heart rate level averaged 184 beat/min with a range between 170 and 202 beat/min. The average maximal  $\dot{V}_{O_2}$  was 1.78 liter/min or 29.8 ml/kg per min. The submaximal ventilatory measurements were similar for all Ss while the heart rate levels at the submaximal work loads differentiated the Ss when grouped according to maximal work-load capacities. Prediction of maximal work capacity could not be made for individuals from any single submaximal measurement. There was .56 correlation between body weight and maximal work capacity with only a .32 relationship between maximal  $\dot{V}_{O_2}$  and  $\dot{V}_{O_2}$  per kilogram body weight.

R 19

27,722

Moroff, S.V. & Bass, D.E. EFFECTS OF OVERHYDRATION ON MAN'S PHYSIOLOGICAL RESPONSES TO WORK IN THE HEAT. *J. appl. Physiol.*, March 1965, 20(2), 267-270. (USA Research Institute of Environmental Medicine, Natick, Mass.).

The question was asked whether men could work in the heat with less physiological strain if they drank water in excess of expected fluid losses than if they merely replaced their losses as they worked. 30 volunteer soldiers walked on 2 successive days for 90 min at 3.5 mph on a level treadmill, at a temperature of 120/80 F dry bulb/wet bulb. Each man drank 2000 ml water before the walk on one day and no water before the walk on the other; 1200 ml were drunk during the walk on both days. Overhydration resulted in significantly lower rectal temperatures and pulse rates and significantly higher sweat rates than did the control state. 2 matched groups of 6 men each were then acclimatized to heat by daily 100-min walks under the conditions described above. 1 group was overhydrated during each day of the acclimatizing period; the other was not. Overhydration did not affect the pattern of acclimatization to heat; conversely, acclimatization to heat did not alter the above-described acute response to overhydration. The hypothesis that overhydration is beneficial to men working in the heat was supported by this study.

R 17

27,723

Goldman, R.F., Green, E.B. & Iampietro, P.F. TOLERANCE OF HOT, WET ENVIRONMENTS BY RESTING MEN. *J. appl. Physiol.*, March 1965, 20(2), 271-277. (USA Natick Labs., Natick, Mass.).

Studies were conducted on 10-man groups exposed at rest to 51 different hot, wet environmental conditions. "Tolerance times" of unacclimatized volunteers established objectively, as the time of occurrence of a rectal temperature of 102.5 F and/or a heart rate of 180 beat/min, were similar to reported values established on a subjective basis. The wet and dry bulb index (WDI) of environment was the best predictor of tolerance time. Prior acclimatization to work in hot, dry conditions did not result in prolonged tolerance for resting men exposed to hot, wet environments; neither did it alter the rates of sweat production, the final skin temperatures, or the rates of increase in heart rate or rectal temperature during these resting, hot, wet environmental exposures. Finally, "passive" resting in hot, wet environments (up to 3 hr/day) did not prolong tolerance times or induce other manifestations of heat acclimatization during subsequent resting exposures to hot, wet environments for either unacclimatized or prior, hot, dry, acclimatized Ss.

R 22

27,724

Senay, L.C., Jr. & Christensen, Margaret L. CUTANEOUS CIRCULATION DURING DEHYDRATION AND HEAT STRESS. *J. appl. Physiol.*, March 1965, 20(2), 278-282. (St. Louis University School of Medicine, St. Louis, Mo.).

Resting Ss were exposed for 12 hr to 43 C dry bulb, 28 C wet bulb, with and without rehydration. During dehydration, average weighted cutaneous opacity pulse amplitudes decreased 19.5%. An apparent relationship between calculated stroke volume and cutaneous pulse amplitudes existed. A 26% increase in heart rate offset decreases in perfusion per beat and probably contributed to a rise in diastolic pressure. Increases in skin temperature paralleled those of oral temperatures. In most Ss evaporative rates were slightly lower during dehydration. Certain dehydrating Ss maintained sweat rates at control levels but this did not prevent an increase in both oral and skin temperatures. Failure of temperature regulation in these experiments does not appear to be due to a decrease in heat transport or evaporation but rather to a lack of responsiveness of the sudomotor and vasomotor systems to increases in body temperature. Reasons for the temperature rise appear complex.

R 14

27,725

Strydom, N.B., Wyndham, C.H., Williams, C.G., Morrison, J.F., et al. ORAL/RECTAL TEMPERATURE DIFFERENCES DURING WORK AND HEAT STRESS. *J. appl. Physiol.*, March 1965, 20(2), 283-287. (Human Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

52 groups of about 20 men each were exposed for 5 hr. to various combinations of work rate, environmental temperature, and wind velocity. Hourly observations were made of oxygen intake and oral and rectal temperatures. Oral/rectal temperature differences increased significantly with time only under those conditions where steady-state responses were not achieved. Increasing wind velocity from 50 to 400 cm/sec., raising air temperatures from 27 to 36 C, and combinations of these factors had no significant influence on the difference between the recorded temperatures. The main contributing factor to oral/rectal temperature difference is work rate. Increasing energy consumption from 2.5 to 9.0 Cal/min. resulted in a rectilinear increase in average difference from 0.5 to 1.1 C. A warning is expressed against the indiscriminate use of oral temperatures in work and heat studies.

R 17



27,726

Bell, C.R., Hellon, R.F., Hiorns, R.W., Nicol, P.B., et al. SAFE EXPOSURE OF MEN TO SEVERE HEAT. *J. appl. Physiol.*, March 1965, 20(2), 288-292. (London School of Hygiene & Tropical Medicine, London, England).

8 men were exposed to hot environments which ranged from 37 C/30 C to 63 C/47 C dry- and wet-bulb temperatures. They remained in the heat until they showed signs of distress just before collapsing. The time taken to reach this state was found to be hyperbolically related to the severity of the environment when this was expressed as a weighted sum of wet- and dry-bulb temperatures. Separate hyperbolae were found for standing and working  $\dot{V}_{O_2}$ . After the deduction of a suitable safety margin, the resulting curves and their equations make possible the prediction of safe exposure times for severe heat.

R 11

27,727

Sinnhuber, R.O. DEVELOPMENT OF RADIATION STERILIZED FISH ITEMS FOR ARMED FORCES FEEDING. Contract DA 19 129 ANC 155(N), Proj. 1 K ) 12501 A 033, Tech. Rep. FD 15, Aug. 1965, 21pp. USA Natick Labs., Natick, Mass. (Oregon State University, Corvallis, Ore.). (AD 619446)

5 radiation-sterilized (4.5 Mrad) seafood products (a) breaded prefried cod patties, b) breaded prefried halibut patties, c) enzyme-inactivated cod patties; d) enzyme-inactivated halibut patties, and e) halibut steaks) processed with and without antioxidants were evaluated periodically during 12-month storage at 72°F by subjective and objective methods. Preference panels of 132 to 210 tasters indicated all 5 products had acceptable flavor after 9-month storage. After 12-month storage, the panels preferred the non-irradiated frozen control samples to the irradiated samples; however, the irradiated samples received flavor scores in the acceptable range with the exception of the prefried halibut patties without antioxidant and halibut steaks with and without antioxidants. The antioxidants had little or no effect on flavor scores. Color reflectance values seemed to be the most reliable method of all the methods studied for measuring length of storage and degree of browning. Sauces, served with enzyme-inactivated halibut patties, proved to be an acceptable alternate method for serving.

R 2

27,728

Cavagna, G.A. & Margaria, R. AN ANALYSIS OF THE MECHANICS OF PHONATION. *J. appl. Physiol.*, March 1965, 20(2), 301-307. (Istituto di Fisiologia Umana, University of Milano, Milano, Italy).

The mechanical work done by the chest in phonation has been measured together with the sound intensity level. The regulation of the sound intensity is done by regulating the intrapulmonary pressure. This is achieved at high intensity levels through the activity of the respiratory muscles that, together with the elastic recoil of the chest, sustain the work of phonation. At sound intensities below a critical level an additional mechanism for changing the intensity is given by a fine regulation of the opening of the glottis, thus allowing more air to escape without contributing to sound production. The contribution of the respiratory muscles, of the chest elasticity, and of the opening of the glottis to phonation at different intensity levels depend on the degree of inflation of the chest. The efficiency of phonation, as of sound production in mechanical models, seems to increase with increasing intensity and pitch.

R 4

27,729

Wyndham, C.H., Morrison, J.F. & Williams, C.G. HEAT REACTIONS OF MALE AND FEMALE CAUCASIANS. *J. appl. Physiol.*, May 1965, 20(3), 357-364. (Human Sciences Lab., Transvaal & Orange Free State Chamber of Mines, Johannesburg, South Africa).

30 male and 26 female Caucasians were tested at work levels of 1.0 liters  $\dot{V}_{O_2}$  consumption in 90 F wet-bulb temperature, 93 F dry-bulb temperature, and 80 ft/min air velocity for comparative heat reactions in the unacclimatized state. The females had more severe physiological and psychological reactions. Rectal temperatures of 104 F and heart rates of 180 beats/min were reached more rapidly than in the male. The females sweated less and their oxygen consumptions were lower than those of the males. 10 males and 4 females were then acclimatized to the same extent at the same work rate in 93 F wet-bulb temperature. At the end of the period their reactions were closely similar, although the females responded slower to the acclimatization procedure. Both groups ended with heart rates of 140 beat/min and rectal temperatures of 102 F. The females, however, continued to sweat less. In a retest at 90 F wet-bulb temperature, both groups had heart rate of 130-140 beat/min and rectal temperatures of 101 F. Females still sweated less. The results demonstrate the fact that females react more severely on exposure to severe heat and work conditions. Once acclimatized, however, the temperature and circulatory reactions of both sexes are closely similar, but the females sweat less than males.

R 5

27,730

Iampietro, P.F., Fiorica, V., Dille, R., Higgins, E.A., et al. INFLUENCE OF A TRANQUILIZER ON TEMPERATURE REGULATION IN MAN. *J. appl. Physiol.*, May 1965, 20(3), 365-370. (US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla.).

The effects of a tranquilizing drug of the propanediol group, meprobamate, on thermal balance of men exposed to a cold (50 F, 10 C), hot (110 F, 43.3 C), or neutral (80 F, 26.7 C) environment have been investigated. Results show that a single dose of meprobamate (800 mg) has no effect on temperature regulation of men resting in a neutral environment. During exposure to hot or cold environments, however, the drug groups showed impairment in thermal balance. In the cold, heat production and core temperature of the drug group were lower than those of the placebo group. In the heat, only moderate elevations in the core temperatures of the drug group were detected. Possible physiological mechanisms responsible for these differences are discussed.

R 12

27,731

McCook, R.D., Wurster, R.D. & Randall, W.C. SUDOMOTOR AND VASOMOTOR RESPONSES TO CHANGING ENVIRONMENTAL TEMPERATURE. J. appl. Physiol., May 1965, 20(3), 371-378. (Physiology Dept., Stritch School of Medicine, Chicago, Ill.).

Male Ss clad only in shorts were exposed in a climate chamber to a slowly rising ambient temperature while sweating, cutaneous volume pulses, and skin, tympanic membrane, and oral temperatures were simultaneously recorded. Mean skin temperature was continuously computed electronically. After sweating and vasodilatation had become well established, the copper screen bed on which the S reclined was rapidly moved from the hot chamber into another, 20-30 C cooler. The onset of neither sweating nor vasodilatation could be accurately correlated with tympanic membrane temperature since the latter was observed to be either increasing, unchanged, or even falling during the period of recruitment. In some experiments, vasodilatation preceded sweating, while in others, it followed. When the S was rapidly moved from the hot environment to the cold, sweating promptly stopped on all of the test areas, and profound vasoconstriction appeared on the palm. Nonpalmar areas, however, showed little or no immediate change in the amplitude of the volume pulses. Mean skin temperature invariably started to fall, but only by a few tenths of a degree when cessation of sweating and palmar constriction occurred. Tympanic membrane temperature during the same period continued to rise for 1-3 min, and thus seemed unrelated to either vasomotor or sudomotor control under these circumstances.

R 24

27,732

Piwonka, R.W., Robinson, S., Gay, V.L. & Manalis, R.S. PREACCLIMATIZATION OF MEN TO HEAT BY TRAINING. J. appl. Physiol., May 1965, 20(3), 379-383. (Anatomy & Physiology Depts., Indiana University, Bloomington, Ind.).

During April 1963, 5 distance runners from the Indiana University track team and 1 champion swimmer performed 85-min walks on a treadmill at 5.6 km/hr up a 5.6% grade in a hot environment (40 C DB, 25% relative humidity). Although none had been exposed to the heat since the preceding summer, the runners made responses typical of heat-acclimatized men. Untrained Ss exposed to the same stresses and the swimmer failed to regulate body temperature effectively. Although sweat rate was less in the runners than in the untrained men, it was 2.4 times greater per degree rise of rectal temperature for the runners. The runners produced 8% less metabolic heat per square meter of body surface than did the untrained men, and they also had much higher tissue heat conductance values. The swimmer's difficulty in adjusting to the heat stress was largely due to his relatively high metabolic cost in walking on the treadmill. It is thought that the preacclimatized state of the trained men probably resulted from the daily elevations of central temperature in their strenuous workouts during the preceding months.

R 19

27,733

Rowell, L.B., Blackmon, J.R., Martin, R.H., Mazzarella, J.A., et al. HEPATIC CLEARANCE OF INDOCYANINE GREEN IN MAN UNDER THERMAL AND EXERCISE STRESSES. J. appl. Physiol., May 1965, 20(3), 384-394. (Cardiology Div., University of Washington School of Medicine, Seattle, Wash.).

At 78 and 110 F hepatic clearance of indocyanine green (ICG),  $O_2$  intake, heart rate, blood lactate, and rectal temperature were measured on 9 men unacclimatized to heat during treadmill exercise, requiring 45-95% of maximal  $O_2$  intake (max  $VO_2$ ). Percentage of resting ICG clearance was inversely proportional to percentage of maximal  $O_2$  intake at 78 F ( $r = -0.78$ ) and 110 F ( $r = -0.81$ ). Clearance of ICG was 20% less at 110 F than at 78 F at all metabolic rates above 26% of maximal  $VO_2$ . Measurements of hepatic blood flow in 3 men at 110 F validate these estimates of percentage decrements in hepatic blood flow. Submaximal and maximal  $VO_2$  and maximal heart rates were unaltered by heat, but maximal heart rates were reached during submaximal work at 110 F. Decreased work capacity at 110 F was unrelated to rectal temperature or blood lactate; the latter was unaffected by temperature. The liver and the kidneys may divert to the skin sufficient blood to obviate the need for additional increments in cardiac output during work at high temperature. Maximal decrements in hepatic blood flow at lower work intensities may contribute to diminished work capacity at 110 F.

R 29

27,734

Goldman, J.K. FREE FATTY ACID RESPONSES TO TILTING AFTER WATER IMMERSION. J. appl. Physiol. May 1965, 20(3), 395-397. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Water immersion is accompanied by decreased urinary excretion of noradrenaline and is followed by orthostatic intolerance. The latter has been postulated to result from impaired noradrenaline metabolism. Such an impairment would produce, in addition, a diminished rise in plasma free fatty acids in response to tilting. This response was measured in normals after office control, water immersion and exposure to a thermal environment identical to that found in the immersion facility. The plasma free fatty acid response to a tilt is impaired after water immersion as would be expected if sympathetic nervous system dysfunction is involved in postimmersion orthostatic intolerance.

R 11

27,735

Budd, G.M. EFFECTS OF COLD EXPOSURE AND EXERCISE IN A WET, COLD ANTARCTIC CLIMATE. J. appl. Physiol., May 1965, 20(3), 417-422. (Environmental Health Sect., University of Sydney, Sydney, Australia).

6 men were studied before and after 6 weeks of strenuous outdoor work and cold exposure--often in wet clothing--on Heard Island in the Antarctic. Physical fitness increased significantly, while subcutaneous fat and arterial blood pressure decreased significantly. The response of rectal temperature and shivering to a 2-hr period of whole-body cooling did not change significantly (although shivering tended to decrease), suggesting that the reduction in insulation caused by loss of fat was balanced by an increase in the insulation of other tissues. Finger temperature fell more rapidly, there was less cold vasodilatation, and the gradient of skin temperature between elbow and finger increased significantly, suggesting that heat was conserved by means of countercurrent heat exchanges and enhanced vasoconstriction. Discomfort from cold did not change. These results support those of a previous study at Mawson, Antarctica. Frostbite of one S's hands, which grossly impaired touch sensation and caused marked intolerance to cold, produced no obvious changes in the response to cold of finger temperature.

R 28

27,736

Finkel, Annette & Cumming, G.R. EFFECTS OF EXERCISE IN THE COLD ON BLOOD CLOTTING AND PLATELETS. J. appl. Physiol., May 1965, 20(3), 423-424. (Children's Hospital of Winnipeg, Manitoba, Canada & University of Manitoba, Winnipeg, Manitoba, Canada).

The tendency to blood clotting as measured by Lee-White clotting time (CT), partial thromboplastin time (PTT), and platelet adhesiveness (PAC) was studied in 10 normal Ss before and after a standardized bicycle exercise done at 25 C inside and at an average temperature of -20 C outside. Inside exercise caused a shortening of CT from 674 to 465 sec, of PTT from 88 to 78 sec, and PAC increased from 65,000/mm<sup>3</sup> to 185,000/mm<sup>3</sup>;  $P < .05$  for all tests, suggesting an increased tendency to blood clotting. In contrast, exercise done in the cold produced no significant changes in these parameters. Heart rate, rectal temperature, and changes in plasma proteins were similar for both types of exercise.

R 11

27,737

Hermansen, L. & Andersen, K.L. AEROBIC WORK CAPACITY IN YOUNG NORWEGIAN MEN AND WOMEN. J. appl. Physiol., May 1965, 20(3), 425-431. (Institute of Work Physiology, Oslo, Norway).

This paper deals with the problem of assessing the range of variability in work capacity of young adult Norwegians. Successful male athletes average 4.8 liter/min or 71 ml/min per kg body weight in maximal oxygen uptake, versus 3.2 liter/min or 44 ml/min per kg body weight for a group of sedentary living men. Female athletes average 3.3 liter/min or 55 ml/min per kg body weight, compared to 2.3 liter/min or 38 ml/min per kg body weight for sedentary women. Oxygen cost of bicycling at submaximal work rates was the same in athletes and nonathletes, but with a clear sex difference, the females possessing a better work efficiency. The linear relationship between heart rate and oxygen uptake becomes curved in the least fit subjects (the sedentary women) when the exercise loads approach the maximal niveau. The maximal heart rate was found lower in athletically trained subjects. The exercise-induced hyperventilation takes place at an oxygen uptake corresponding to 70-80% of the capacity, this being the same in both sexes and uninfluenced by athletics.

R 19

27,738

Andersen, K.L. & Hermansen, L. AEROBIC WORK CAPACITY IN MIDDLE-AGED NORWEGIAN MEN. J. appl. Physiol., May 1965, 20(3), 432-436. (Institute of Work Physiology, Oslo, Norway).

Maximal oxygen uptake and related respiratory and circulatory functions were measured in sedentary and well-trained middle-aged men. Maximal oxygen uptakes averaged 2.63 liter/min in sedentary men and 3.36 liter/min in well-trained men, the latter value being essentially the same as found in young untrained students. The heart rate/oxygen uptake relationship was found to be the same for sedentary-living men, regardless of age, but maximal heart rate was lower in older men. The maximal heart rate is probably the same in well-trained as in sedentary middle-aged men, this in contrast to what has been observed in younger age groups, where training reduces maximal heart rate. The exercise-induced hyperventilation takes place at an oxygen uptake corresponding to 70-80% of the capacity, this being the same in trained and untrained, and essentially the same as found in young adult subjects.

R 6

27,739

Silverman, J. A METHOD FOR STRUCTURING TECHNICAL TASKS (TECHNICAL SUPPLEMENT). Proj. PF016011001, Tech. Bull. STB 66 4A, Aug. 1965, 109pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 620840)

Research is being conducted to develop a method for determining technical skills required for current and future weapons and support systems which will serve as a basis for the Navy enlisted classification structure required in the next decade. A method for classifying tasks by complexity was developed in this research and reported on in STB 66-4, (cf. HEIAS 27,742). The present report (STB 66-4A) is a Technical Supplement to that report and contains copies of the questionnaires, task lists, and other forms associated with the task classification method.

R 3

27,740

Freedman, S. & Weinstein, S.A. EFFECTS OF EXTERNAL ELASTIC AND THRESHOLD LOADING ON BREATHING IN MAN. J. appl. Physiol., May 1965, 20(3), 469-472. (Environmental Medicine & Psychiatry Depts., Johns Hopkins University, Baltimore, Md.).

Conscious human subjects, seated in a soundproof chamber, were made at intervals to inspire through external elastic or threshold loads for from 4 to 15 breaths. With threshold loading of -5 to -15 cm H<sub>2</sub>O (13 Ss) initially, the first loaded breath was smaller than preceding breaths with tidal volume returning to normal within 6 breaths. With further presentations, tidal volume returned to control values sooner. After 6 presentations, 10 Ss had no diminution in tidal volume on the first loaded breath. With elastic loading, of 10 cm H<sub>2</sub>O/liter (5 Ss) and 19.5 cm H<sub>2</sub>O/liter (4 Ss) a different type of adaptation occurred. This was characterized by decreased tidal volume and increased frequency. With the larger load, after 3 presentations frequency was increased during loaded breathing, due to a conscious effort by the Ss. The results show that repeated presentation of an elastic or threshold load leads to a change in the response to the load in a manner analogous to the learning of voluntary motor acts.

R 4

27,741

Hoshiko, M.S. LUNG VOLUME FOR INITIATION OF PHONATION. J. appl. Physiol., May 1965, 20(3), 480-482. (Speech Correction Dept., Southern Illinois University, Carbondale, Ill.).

The percent of vital capacity at which phonation is normally initiated was investigated. 30 normal young male and 30 normal young female adults breathed oxygen in a closed circuit respirometer in a standing position. Vital capacity, expiratory reserve, tidal volume for breathing, and phonation volume were determined for each subject. The mean percent of vital capacity at which phonation is normally initiated was found to be 49.7 for males and 50.3 for females. These values approximate end-inspiratory volumes during quiet breathing in the upright posture.

R 9

27,742

Silverman, J. A METHOD FOR STRUCTURING TECHNICAL TASKS. Proj. PF016011001, Tech. Bull. STB 66 4, Aug. 1965, 37pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 620839)

Research is being conducted to develop a method for determining technical skills required for current and future weapons and support systems which will serve as a basis for the Navy enlisted classification structure required in the next decade. This report describes a statistical technique which has been devised to classify work tasks by their level of complexity. Copies of the questionnaires, task lists, and other forms associated with the task classification method are contained in a Technical Supplement (STB 66-4A), (cf. HEIAS 27,739).

R 18

27,743

Glassford, R.G., Baycroft, G.H.Y., Sedgwick, A.W. & Macnab, R.B.J. COMPARISON OF MAXIMAL OXYGEN UPTAKE VALUES DETERMINED BY PREDICTED AND ACTUAL METHODS. J. appl. Physiol., May 1965, 20(3), 509-513. (Physical Education Faculty, University of Alberta, Edmonton, Alberta, Canada).

24 male Ss aged 17-33 were given 3 direct tests of maximal oxygen uptake and 1 indirect test. The direct tests were those of Mitchell, Sproule, and Chapman (treadmill); Taylor, Buskirk, and Henschel (treadmill); and Astrand (bicycle ergometer). The indirect test was the Astrand-Ryhming nomogram (bicycle ergometer) employing heart rate response to submaximal work. In addition, the Johnson, Brouha, and Darling physical fitness test was administered. The 2 treadmill tests and the indirect test yielded significantly higher mean values than did the direct bicycle test. However no other significant differences in mean values occurred. Correlation coefficients between the various oxygen uptake tests as well as the fitness test were all found to be significant (.62-.83), i.e., greater than zero. No correlation obtained proved to be significantly greater than any other. The results indicate that direct treadmill tests, employing greater muscle mass, yield higher maximal oxygen uptake values (8%) than does the direct bicycle ergometer tests. The Astrand-Ryhming nomogram appears to produce a good estimation of maximal oxygen uptake, in a population unaccustomed to cycling.

R 22

27,744

Kreuzer, F. & Campagne, P.V.L. RESTING PULMONARY DIFFUSING CAPACITY FOR CO AND O<sub>2</sub> AT HIGH ALTITUDE. J. appl. Physiol., May 1965, 20(3), 519-524. (Physiology Dept., University of Nijmegen, Nijmegen, The Netherlands).

The possible increase of pulmonary diffusing capacity at high altitude is still controversial. During an expedition on Monte Rosa, Italy, experiments were performed on 5 male Ss, 27-44 yrs of age, at rest after a sojourn of 7-10 days at an elevation of 4560 m, using 2 independent methods. Pulmonary diffusing capacity for CO (DL<sub>CO</sub>) was determined with the steady-state method at 3 levels of oxygenation with inspiratory O<sub>2</sub> pressures of 80, 150, and 400 mm Hg both at sea level and at altitude. The evaluation of the O<sub>2</sub> pressure diffusion gradients in hypoxia, obtained from the alveolar-arterial O<sub>2</sub> pressure gradients and the arterio-alveolar CO<sub>2</sub> pressure gradients in hypoxia, permitted the estimation of the diffusing capacity for O<sub>2</sub> (DL<sub>O2</sub>). There was no significant difference between sea level and high altitude in DL<sub>CO</sub> at the 3 levels of oxygenation, in the O<sub>2</sub> diffusion gradient and in DL<sub>CO2</sub> with hypoxia.

R 27

27,745

Snyder, R.D. SURVIVAL OF HIGH-VELOCITY FREE-FALLS IN WATER. Rep. AM 65 12, April 1965, 12pp. US Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla. (AD 620021)

44 cases of free-falls survived by individuals impacting water environments under conditions of high velocity (50 to 176 ft/sec) have been intensively investigated and analyzed. Ages varied from 7 to 80 yrs and the study included 34 males and 10 females. The falls occurred in 17 different states primarily over a 3-yr period, and included attempted suicides, accidental falls from high structures, and parachute failures in jumping or evacuating from aircraft. It was found that: a) The most survivable body orientation, by a factor of 5 to 7, is in a feet-first (+G<sub>z</sub>) impact with arms over the head, due to increased time duration of deceleration caused by minimal body-surface-area braking action; b) Critical velocity for human survival of water impact in the feet-first body position appears to be at about 100 ft/sec, and 85 to 97 ft/sec in other positions; c) No correlation between velocity (or distance of fall) and degree of trauma was found; injuries appeared to be more dependent upon body position at all levels of force; the pattern of injuries in feet-first position include 68% with fractures, 14% internal trauma; 33% no clinical trauma; in prone and spine impacts 100% had body contusions and internal trauma; there was a distinct correlation between age and survival as velocity increased (could reflect higher exposure rate); sex did not appear to be a factor in survival; other factors of varying influence included wind velocity, water condition, clothing, physical and mental condition and drugs.

R 29

27,746

Rizy, E.F. COLOR SPECIFICATION FOR ADDITIVE COLOR GROUP DISPLAYS. Contract DS 63 15, Proj. 5597, Task 559705, RADC TR 65 278, Aug. 1965, 40pp. USAF Display Techniques Branch, RADC, Griffiss AFB, N.Y. (AD 621068)

9 pairs of dichroic filters were used in a xenon-source additive color projector to determine their effects upon observer performance in a search-and-discrimination task with 7 color codes. The objective was to define performance parameters preliminary to setting filter specifications. Results indicated that a blue filter reflecting wavelengths well into the green region facilitated performance in the majority of color codes. A red filter close to the infrared in reflectance reduced performance in most codes. The most efficient color code, regardless of filter, was red. Green, blue and cyan were least efficient. Recommendations were made suggesting a blue filter of approximately 516 mμ cutoff and a red filter with a cutoff between 581 & 595 mμ for optimum observer performance in the context of a 7-color code. Performance criteria were compared and an alternate filter option was described. Further examination of the areas around the most adequate cutoff points and alternate filter arrangements were proposed as the next step toward setting firm specifications.

R 12

27,747

Robinson, S., Meyer, F.R., Newton, J.L., Ts'ao, C.H., et al. RELATIONS BETWEEN SWEATING, CUTANEOUS BLOOD FLOW, AND BODY TEMPERATURE IN WORK. *J. appl. Physiol.*, July 1965, 20(4), 575-582. (Anatomy & Physiology Depts., Indiana University, Bloomington, Ind.).

Men worked on a treadmill for periods of 5, 5, 10, 10, 10, and 10 min, stopping for 2 min between work periods to be weighed. Finger and M skin temperatures decreased at the beginning of work (10 mets). When room temperature was 25 C vasodilation occurred in the finger in the third work period as gastrocnemius muscle and femoral vein temperatures reached maximal values. Temperatures of skin and saphenous vein blood rose rapidly as the men reclined during the rest periods and decreased when work was resumed, coinciding with changes of femoral temperature in the opposite directions. These rapid shifts in temperature indicate that during the rest periods the proportion of blood coming from the skin into the trunk of the femoral was greater than during the work periods. The onset of sweating, the rate of its increase in the early stages of these work experiments, and its decline in recovery more nearly paralleled corresponding changes in femoral temperature than any of the other temperatures measured.

R 14

27,748

Robinson, S., Belding, H.S., Consolazio, F.C., Horvath, S.M., et al. ACCLIMATIZATION OF OLDER MEN TO WORK IN HEAT. *J. appl. Physiol.*, July 1965, 20(4), 583-586. (Anatomy & Physiology Depts., Indiana University, Bloomington, Ind.).

4 men, ages 44-60, repeated daily work experiments in the heat by which they had demonstrated on themselves rapid acclimatization to work in a hot climate 21 years earlier. The work, heat stress, and duration of exposure were those originally found to cause marked hyperpyrexia and circulatory strain in unacclimatized men (M age 31 yrs) on the first day in the heat. Under these conditions, the Ss sweated at 1.3-1.5 kg/hr. Tolerance of the men on the first day of exposure was no less than when they were younger. Body temperatures and heart rates of the older men were lowered in successive days of exposure and the work was judged progressively easier. Final values of body temperature reached after 5-7 days of exposure were about the same as observed originally after the same number of exposures. Thus, these older men exhibited about the same degree of strain during work in the heat as they did 21 years earlier and acclimatized about as well.

R 8

27,749

Cunningham, W.L., Becker, E.J., & Kreuzer, F. CATECHOLAMINES IN PLASMA AND URINE AT HIGH ALTITUDE. *J. appl. Physiol.*, July 1965, 20(4), 607-610. (Physiology Dept., University of Nijmegen, Nijmegen, The Netherlands).

The concentration of free epinephrine and norepinephrine in plasma and 24-hr urine samples collected from members of the Dutch Monte Rosa expedition (July 1963) was investigated during 17 days at various altitudes up to 4,560 m. The results indicate that the levels of both plasma and urine catecholamines were elevated during the expedition, the plasma levels reaching a maximum towards the end of the 12 days sojourn at 4,560 m. In general there was a twofold increase in total catecholamine concentration in the samples collected at high altitude as compared to control values at sea level. This difference was due to a significant increase in the norepinephrine concentration; there was little change in epinephrine level.

R 11

27,750

Hanson, J.S., Tabakin, B.S., Levy, A.M. & Falsetti, H.L. ALTERATIONS IN PULMONARY MECHANICS WITH AIRWAY OBSTRUCTION DURING REST AND EXERCISE. *J. appl. Physiol.*, July 1965, 20(4), 664-668. (Cardiopulmonary Lab., University of Vermont College of Medicine, Burlington, Vt.).

The effects of artificial expiratory airway obstruction on pulmonary compliance, work of breathing, and pressure-flow relationships have been studied in 5 normal young males at rest and during treadmill exercise. The finding of a significant decrease in compliance during resistance breathing strongly suggests that alterations in pulmonary blood volume have occurred. In addition, there is evidence that uniformity of gas distribution within the lung has been impaired, a finding which is consonant with previously studied changes in lung volumes secondary to the obstruction.

R 17

27,751

Greenleaf, J.E. & Sargent, F., II. VOLUNTARY DEHYDRATION IN MAN. *J. appl. Physiol.*, July 1965, 20(4), 719-724. (Physiology & Biophysics Depts., University of Illinois, Urbana, Ill.).

The effects singly and in combination of heat, exercise, and hypohydration upon voluntary dehydration were studied in 4 acclimated, physically fit, young men. Voluntary dehydration is the delay in complete rehydration following water loss. Hypohydration refers to the state of decreased water content while the osmotic concentration of the body is maintained. Ad libitum drinking during the heat experiments was 146% greater than it was in the cool experiments. Hypohydration increased drinking 109% over the corresponding hydration experiment, exercise increased water intake 41% over resting. Hypohydration and exercise were less effective than heat in stimulating drinking. During the 4-hr experimental periods, the Ss did not or could not drink enough to compensate for the water lost. Regardless of the magnitude of the water deficit at the beginning of the recovery periods, the rates of rehydration were the same. The more stressful the experiment, the greater the water consumption and, in general, the longer it took to regain the lost water.

R 21

27,752

Nagle, F.J., Balke, B. & Naughton, J.P. GRADATIONAL STEP TESTS FOR ASSESSING WORK CAPACITY. *J. appl. Physiol.*, July 1965, 20(4), 745-748. (Medicine & Physiology Depts., University of Oklahoma Medical Center, Oklahoma City, Okla.).

The feasibility of a gradational step test for the assessment of work capacity was investigated. A device was constructed on which the level of a stepping platform could be raised between 2.0 and 50 cm as Ss continued work at a prescribed stepping rate. 2 test procedures applicable to individuals who vary in their state of health from that of a chronically ill patient to a trained athlete are described. 60 men performed experiments to establish the minute-by-minute metabolic costs of the work in the 2 tests. The  $O_2$  expenditures ranged from  $12.9 \pm 1.2$  to  $40.8 \pm 3.5$  ml/min per kg in the 30/min step test and from  $10.7 \pm 1.1$  to  $28.8 \pm 1.3$  ml/min per kg in the 24/min step test. The procedures are well suited for measuring various physiological parameters during stepping and for establishing physiological working limits. The  $O_2$  costs of the "negative" and "positive" work components in stepping were determined. The cost of negative work was approximately 1/3 of the positive work. An equation was derived for predicting the metabolic costs of stepping at various rates and platform levels. Comparisons of predicted and measured  $O_2$  intake values for the 30-step and 24-step tests approximated one another at all levels of energy expenditure.

R 5

27,753

Klausen, K. COMPARISON OF  $CO_2$  REBREATHING AND ACETYLENE METHODS FOR CARDIAC OUTPUT. *J. appl. Physiol.*, July 1965, 20(4), 763-766. (Theory of Gymnastics Lab., University of Copenhagen, Copenhagen, Denmark).

The cardiac output during rest and work was determined by a  $CO_2$  rebreathing method as suggested by Defares. The partial pressure of  $CO_2$  in the mixed venous blood ( $PV_{CO_2}$ ) was calculated from the rise of the  $CO_2$  percent in a Grollman bag during rebreathing. In the rest experiments the partial pressure of  $CO_2$  in arterial blood ( $Pa_{CO_2}$ ) was obtained from analysis of alveolar samples taken by the Haldane-Priestley direct sampling method. In the work experiments the  $Pa_{CO_2}$  was calculated using the Bohr formula and a dead space estimated from Asmussen and Nielsen's data. The metabolic rate including both  $O_2$  uptake and  $CO_2$  output was determined by the Douglas bag method. In each experiment the acetylene method as described by Christensen was applied after the  $CO_2$  rebreathing method. The values obtained by the 2 methods were almost identical, the standard deviation for all experiments being  $\pm 7.3\%$ , and were of the same magnitude as those obtained by others with the dye-dilution or direct Fick method both during rest and work.

R 15

27,754

Schwartz, W.B. & Silverman, Leslie. A LARGE ENVIRONMENTAL CHAMBER FOR THE STUDY OF HYPERCAPNIA AND HYPOXIA. *J. appl. Physiol.*, July 1965, 20(4), 767-774. (Medicine Dept., Tufts University School of Medicine, Boston, Mass. & Industrial Hygiene Dept., Harvard University School of Public Health, Boston, Mass.).

The design and operating characteristics of an environmental chamber which can maintain  $CO_2$  concentrations between 1 and 20% and  $O_2$  concentrations between 5 and 21% are described. The chamber, which measures  $3.66 \times 6.10$  m (12 x 20 ft), permits acute and chronic studies to be carried out in either large animals or man. Multiple safety features serve to protect the occupants against failure of equipment or controls. The relative ease with which investigators can work in the chamber, the convenience of long-term operation, and the reliability of the system which controls the gas concentrations provide a unit which has proved useful for the investigation of a variety of physiologic phenomena related to hypercapnia. Preliminary observations indicate that acute and chronic studies of hypoxia will be equally feasible.

R 6

27,755

Rainey, R.B., Jr. DEVELOPMENT OF SUPPORT REQUIREMENTS FOR GROUND FORCES IN CONVENTIONAL OPERATIONS. Rep. P 3173, July 1965, 9pp. Rand Corporation, Santa Monica, Calif. (AD 619701)

This paper describes the development of a computer-assisted scheme for use in developing and comparing a wide variety of Army force postures in terms of cost effectiveness, time requirements, and logistics support relative to combat activity. The manner in which support requirements are estimated is discussed and some examples cited. (HEIAS)

27,756

Young, W.A., Shaw, D.B., Navach, J., Shizgal, H., et al. EFFECT OF  $CO_2$  AND WHOLE-BODY VIBRATION ON VENTILATION. *J. appl. Physiol.*, Sept. 1965, 20(5), 844-848. (Royal Victoria Hospital, McGill University, Montreal, Quebec, Canada).

The ventilatory response of 6 Ss to increasing levels of alveolar  $CO_2$  was measured at rest and during the hyperventilation induced by passive vibratory movements of the whole body. During vibration, addition of  $CO_2$  to the inspired air produced no increase in ventilation until the  $Pa_{CO_2}$  reached a critical level which coincided closely with the intersection of the vibration with the resting  $CO_2$  response curve. Above this level the vibration curve was almost superimposed on the resting one. There was no evidence of an additive effect of the 2 stimuli, and no increase in sensitivity to  $CO_2$  during vibration. In these respects the situation differs from that in which  $CO_2$  is combined with hypoxia or hyperthermia. The findings indicate that when respiration is stimulated by vibration and  $CO_2$  simultaneously, the resultant ventilation at any point is solely that produced by the stronger of the 2 stimuli.

R 10

27,757

Zechman, F.W., Jr., Peck, D. & Luce, E. EFFECT OF VERTICAL VIBRATION ON RESPIRATORY AIRFLOW AND TRANSPULMONARY PRESSURE. *J. appl. Physiol.*, Sept. 1965, 20(5), 849-854. (Physiology & Biophysics Depts., University of Kentucky College of Medicine, Lexington, Ky.).

The response of the human thoracoabdominal system to whole-body, vertical, sinusoidal vibration has been studied. Peak acceleration of the shake table was held constant ( $\pm 0.5$  G), and frequency varied between 2 and 10 cps. Ss were seated with trunk axes parallel with the direction of acceleration. The amplitude of forced airflow oscillation increased with frequency to an average 1,368 cm<sup>3</sup>/sec. at 6 cps and then decreased. The maximum average volume of air forced in or out of the lung with vibration was 46 cm<sup>3</sup> at 5 cps. Transpulmonary pressure fluctuation exhibited a peak average amplitude of 5.44 cm H<sub>2</sub>O at 5 cps. The response to square-wave table motion was also investigated. The transient flow oscillation produced by the step function had an average frequency of 5.6 cps. Measurements of the logarithmic decrement of transient flow oscillation indicate the total thoracoabdominal system is underdamped ( $\eta = 0.1-0.2$ ). The calculated damping for the lung subsystem indicates very high damping ( $\eta = 4.5$ ). Measurements of abdominal deformation produced by the step function suggest the transient flow oscillations result from close coupling of the lung to other components of the thoracoabdominal system.

R 15

27,758

Guyatt, A.R., Newman, Faith, Cinkotai, F.F., Palmer, J.I., et al. PULMONARY DIFFUSING CAPACITY IN MAN DURING IMMERSION IN WATER. *J. appl. Physiol.*, Sept. 1965, 20(5), 878-881. (Occupational Health & Applied Physiology Dept., London School of Hygiene & Tropical Medicine, London, England).

During immersion in water to the neck, 7 seated resting normal Ss showed, without exception in 14 trials, an increase in diffusing capacity of the lung ( $DL_{CO}$ ) which averaged  $16.2 \pm 0.79$  SD% of the control (unimmersed) values ( $P < 0.001$ ). At an intermediate depth of immersion at which the calculated hydrostatic pressure (gauge) was approximately halved, the rise in  $DL_{CO}$  was also halved. The hemodynamic readjustment to external pressure was completed within a few minutes, since no further change in  $DL_{CO}$  occurred during continuous immersion to the neck for as long as 90 min. Immersion produced a rise in "permeability" of the lung ( $K_{CO}$ ) which was on the average 5.8% greater than that in  $DL_{CO}$ . In 3 Ss the pulmonary capillary blood volume ( $V_c$ ) rose on the average 47% at the deeper level of immersion, suggesting that, as in the pressure suit, the rise in  $DL_{CO}$  was due to pulmonary vascular engorgement.

R 23

27,759

Dejours, P., Puccinelli, R., Armand, J. & Dicharry, M. CONCEPT AND MEASUREMENT OF VENTILATORY SENSITIVITY TO CARBON DIOXIDE. *J. appl. Physiol.*, Sept. 1965, 20(5), 890-897. (Physiology Lab., Faculte' de Medecine et Center Marie-Lannelongue, Paris, France).

4 resting Ss breathed 0, 1, 2.5, & 4% CO<sub>2</sub> diluted in air for 25 min. Ventilation,  $P_{O_2}$  and  $P_{CO_2}$  of alveolar and expired gases were measured. One can represent on a  $P_{O_2}$ - $P_{CO_2}$  diagram, as Rahn and Fenn have done, some features of the reaction to CO<sub>2</sub>, and plot lines of "ventilatory isosensitivity to CO<sub>2</sub>." The relation between experimental points and these lines shows why "ventilatory CO<sub>2</sub> sensitivity,"  $\Delta V_A / \Delta P_{A_{CO_2}}$ , for normal conditions cannot be quantified by the classical procedure of giving one or several percent CO<sub>2</sub> to breathe. CO<sub>2</sub> sensitivity nonetheless exists normally, since in Ss breathing mixtures containing a few mm Hg CO<sub>2</sub>,  $P_{A_{CO_2}}$  is practically unchanged, while  $P_{O_2}$  rises by several mm Hg. The difficulties of accurately measuring  $\Delta V_A / \Delta P_{A_{CO_2}}$  suggest caution in accepting some mathematical developments often applied to raw data, and in taking this ratio as a true index of ventilatory CO<sub>2</sub> sensitivity, particularly when measurements made with high inspired CO<sub>2</sub> concentration are used to interpret the regulation of normal respiration.

R 31

27,760

Becklake, Margaret, R., Frank, H., Dagenais, G.R., Ostiguy, G.L., et al. INFLUENCE OF AGE AND SEX ON EXERCISE CARDIAC OUTPUT. *J. appl. Physiol.*, Sept. 1965, 20(5), 938-947. (Royal Victoria Hospital, McGill University, Montreal, Quebec, Canada).

Exercise cardiac output has been measured by an indirect Fick technique in 94 normal Ss (48 men and 46 women) whose ages ranged from 20 to 85 yrs. With increasing age, exercise cardiac output was found to be greater despite no such trend in oxygen uptake; in consequence, exercise arteriovenous oxygen difference decreased with age. These trends were seen in both sexes, though the age effects were apparent a decade earlier in men. In addition, in men the heart rate was lower and stroke volume higher with increasing age. By contrast, no age effect on exercise pulse rate was noted in women. When the sexes were compared, exercise cardiac output was higher in women of the younger 2 decades (20 to 39 yrs), a difference which was not apparent in subsequent decades.

R 35

27,761

Roby, T.B. & Carterette, Teresa. THE MEASUREMENT OF CONFIDENCE AND TRUST. Contract AF 19(628) 2450, Proj. 7682, Task 768203, ESD TDR 65 299, April 1965, 27pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Tufts University, Medford, Mass.). (AD 619953)

This report is concerned with the development of a research methodology and a theoretical framework for investigating the effects of social influence in a simple judgmental situation. The laboratory task entails a simple binary judgment as to whether a displayed angle departs from 90°; before making his own response the S is provided with the answer of a hypothetical partner, programmed at a certain fixed accuracy level. The responses are made in terms of a special betting scheme which penalizes the S for overstating or understating his confidence. The 2 main experimental variables in this study are the difficulty of the discrimination and the announced reliability of the hypothetical partner. Theoretical predictions as to the effects of these variables on the relative value of confidence measures are confirmed. However, further methodological development is required to increase the realism of Ss' confidence scores.

R 7

27,762

Senay, L.C., Jr. & Christensen, Margaret L. CARDIOVASCULAR AND SWEATING RESPONSES TO WATER INGESTION DURING DEHYDRATION. J. appl. Physiol., Sept. 1965, 20(5), 975-979. (St. Louis University School of Medicine, St. Louis, Mo.).

The experiments reported are concerned with cardiovascular and sudomotor events preceding, accompanying, and following ingestion of water by 5 dehydrating Ss 8.75 hr after entrance into a heat chamber (43.3 C DB, 29 C WB). Certain skin areas such as the cheek showed increases in evaporative heat loss before Ss came in contact with water. This reflex could be initiated by saline ingestion but the degree of skin and oral temperature changes appeared to depend on tonicity of fluid ingested. The gustatory reflex was not thought to be the initiating agent for sudomotor responses. Increases in cutaneous blood flow appeared to begin almost as promptly as sweating response but took considerably longer to develop. Ingestion of saline, though initiating a sweating response, did not alter heart rate, blood pressure, or cutaneous blood flow. It is suggested that fluid ingestion, regardless of tonicity, triggers reflex sweating over the body surface. Intensity and duration of this sudomotor response, as well as initiation of cardiovascular changes, apparently depend on tonicity of ingested fluid.

R 14

27,763

Colin, J. & Houdas, Y. INITIATION OF SWEATING IN MAN AFTER ABRUPT RISE IN ENVIRONMENTAL TEMPERATURE. J. appl. Physiol., Sept. 1965, 20(5), 984-990. (USAF Aerospace Medical Lab., Flight Test Center, Bretigny-sur-Orge, Seine-et-Oise, France).

In 38 experiments a total of 8 men were subjected, after a long waiting period in a neutral environment, to an abrupt rise in environmental temperature. Skin, rectal, oral, and tympanic temperatures, and weight loss were continuously recorded. 2 types of responses were seen: a) nonadapted Ss presented a delay in the onset of sweating, with a good correlation between this onset and rise in rectal or tympanic temperature, but without correlation with rise in skin temperature; b) adapted Ss presented an immediate onset of sweating without correlation with rectal temperature, and a second acceleration of sweating corresponding to the rise of rectal temperature. It is concluded that for nonadapted Ss the mechanism of sweating is activated by centrally located receptors, but that in adapted Ss, skin receptors are able to activate the sweating mechanism before central receptors feed their impulses to the heat loss center.

R 23

27,764

Ismail, A.H., Falls, H.B. & MacLeod, D.F. DEVELOPMENT OF A CRITERION FOR PHYSICAL FITNESS TESTS FROM FACTOR ANALYSIS RESULTS. J. appl. Physiol., Sept. 1965, 20(5), 991-999. (Physical Education Dept., Purdue University, Lafayette, Ind.).

The purpose of the study is twofold: a) to illustrate a method whereby it is possible to combine the various criteria for physical fitness to form one composite criterion; and b) to develop physical fitness test batteries. As a result, a method for combining the various criteria of physical fitness tests into one composite criterion was described. Furthermore, physical fitness test batteries were developed.

R 30

27,765

Suggs, C.W. SOME RESPONSES OF HUMANS TO THERMAL RADIATION. J. appl. Physiol., Sept. 1965, 20(5), 1000-1005. (Agricultural Engineering Dept., University of North Carolina, Raleigh, N.C.).

The effects of thermal radiation on heart rate, ventilation rate, and oxygen consumption rate were investigated at various conditions of dry-bulb temperature, air velocity, and exercise. Ventilation rate and oxygen consumption rate were essentially independent of thermal radiation under all the environmental conditions investigated. However, heart rate increased appreciably with increases in thermal radiation provided the environment was already warm or hot. In the range between 70 and 100 F dry bulb, a 7 F increase in mean radiant temperature was found to elicit the same average increase in heart rate as a 1 F increase in dry bulb. For a cool environment the response tended to be reversed with the heart rate decreasing as the environment was made more comfortable by the addition of thermal radiation. Exercise shifted the point at which this reversal occurred toward lower temperatures.

R 16

27,766

Stolwijk, J.A.J. & Hardy, J.D. SKIN AND SUBCUTANEOUS TEMPERATURE CHANGES DURING EXPOSURE TO INTENSE THERMAL RADIATION. J. appl. Physiol., Sept. 1965, 20(5), 1006-1013. (John B. Pierce Foundation Laboratory, New Haven, Conn.).

Radiometric measurements have been made of the skin temperature changes occurring during irradiation of the body by high-intensity thermal radiation with square-wave pulses. A quartz lamp bank provided a source of color temperature of 2650 K and a uniform ( $\pm 5\%$ ) irradiance of 0.16 cal/sec per  $\text{cm}^2$  over areas of 40 x 30 cm. A spring-operated focal-plane shutter controlled exposure times from 2-120 sec with a rise time of 0.01 sec. The radiometer, mounted between the quartz lamps so as to view the skin from normal incidence, has a 96% response time of 0.1 sec and a precision of  $\pm 0.1$  C. When corrections were made to allow for the far infrared radiation reflected from the skin, the radiometer gave accurate measurements of skin temperature during the periods of irradiation. Experimental values of skin temperature rise were compared with those calculated by the finite differences method for various skin layers using the best available values for optical and thermal properties of each skin layer. During the initial 10-15 sec of irradiation, theoretical and experimental values were in agreement, indicating passive response of the skin to thermal radiation. Subcutaneous temperatures, calculated from surface temperature data, indicated a high degree of penetration of the radiation 0.2-0.4 mm below the skin surface.

R 12



27,767

Hardy, J.D., Stolwijk, J.A.J., Hammel, H.T. & Murgatroyd, D. SKIN TEMPERATURE AND CUTANEOUS PAIN DURING WARM WATER IMMERSION. *J. appl. Physiol.*, Sept. 1965, 20(5), 1014-1021. (John B. Pierce Foundation Laboratory, New Haven, Conn.).

Measurements of skin temperature were made during the sudden immersion of the skin of human Ss in water baths at 36-41 C and related to the reports of pain elicited during the first few seconds of immersion. Within 0.5 sec, the skin temperature rose to bath temperature and remained at this level during the 10-15 sec of immersion, pain was reported at 37-41 C occurring 1-5 sec after the start of the immersion and adapting in 2-6 sec. Calculation of the subcutaneous temperature and thermal gradients indicate maximal thermal gradients in superficial skin layers during the first 0.1-0.2 sec of immersion (60 C/mm) decreasing rapidly during the first 5 sec to 6 C/mm. Analysis of the transient pain indicated that it could be considered as the more sensitive "phasic" response of the pain ending of which the "static" unadapting response occurs at skin temperatures of 43-46 C. Several alternative explanations including subcutaneous thermal gradients, vasomotor reactions, and thermochemical changes in the nerve membrane were considered as possible explanations. The last most likely possibility requires a second-order kinetic system of 3 capacities with highly temperature-sensitive reaction velocities to account for both the phasic and static components of the pain.

R 25

27,768

Lozano, R. & Monge C., C. RENAL FUNCTION IN HIGH-ALTITUDE NATIVES AND IN NATIVES WITH CHRONIC MOUNTAIN SICKNESS. *J. appl. Physiol.*, Sept. 1965, 20(5), 1026-1027. (Instituto de Investigaciones de Altura, Lima, Peru).

When compared with sea-level residents, the healthy natives living at an altitude of 4540 m show a 12% reduction in the glomerular filtration rate, a 37% reduction in effective renal plasma flow, a 12% reduction in effective renal blood flow, and an increase of 39% in the filtration fraction. The corresponding values in patients with chronic mountain sickness living at 4300 m above sea level are: glomerular filtration rate, 32% reduction; effective renal plasma flow, 57% reduction, effective renal blood flow, 9% increase; and filtration fraction, 56% increase. The mean hematocrit values of the healthy and sick natives investigated were 59 and 79%, respectively. The possible relationships between cardiac output, hematocrit values, and renal hemodynamics are discussed.

R 13

27,769

Paulev, P. DECOMPRESSION SICKNESS FOLLOWING REPEATED BREATH-HOLD DIVES. *J. appl. Physiol.*, Sept. 1965, 20(5), 1028-1031. (Physiology Institute, University of Aarhus, Aarhus, Denmark).

A report is given of a case of apparent decompression sickness after repetitive breath-hold dives to depths of 50-66 ft (15-20 m). 3 similar cases in Norwegian Navy escape-training-tank instructors are also discussed. A parallel is drawn between the Scandinavian cases and the "pearl diver disease" (taravana), found in the Tuamotu Archipelago in the South Pacific. Symptoms and signs in these conditions are consistent with the diagnosis of decompression sickness. It is emphasized that in such cases immediate recompression is the treatment of choice. Consideration of various depths and patterns of breath-hold diving in terms of nitrogen uptake and elimination permits the relative risk of decompression sickness to be predicted with the help of decompression tables.

R 13

27,770

Rigney, J.W., Cremer, R.H. & Towne, D.M. THE DESIGN OF ELECTRONIC EQUIPMENT FOR EASE OF MAINTENANCE: CURRENT ENGINEERING DESIGN PRACTICES. Contract Nonr 228(22), Proj. NR 153 093, Tech. Rep. 41, Aug. 1965, 65pp. *USN Personnel & Training Branch*, ONR, Washington, D.C. (Psychology Dept., University of Southern California, Los Angeles, Calif.). (AD 470377)

This report reviews the problem of designing electronic equipment for ease of maintenance. Stages in the development of electronic systems in the Navy are reviewed. Contractor design management problems are described, and primary and secondary engineering design cycles are discussed. A major section of the report analyzes the problem of designing for ease of maintenance, identifying objectives, variables, and categories of design strategies. A final section of the report describes a preliminary model of relationships among the major factors involved. The report concludes that at least 4 broad changes will be necessary before appreciable improvements can occur in electronics maintainability: changes in military customer procurement practices, the development of a technology of maintainability, specification of quantitative criteria for design, and changes in attitudes towards maintainability both on the part of the customer and the contractor which would accord it the importance it actually has in determining operational usefulness of a system.

R 13

27,771

Fowler, W.M., Jr., Gardner, G.W. & Egstrom, G.H. EFFECT OF AN ANABOLIC STEROID ON PHYSICAL PERFORMANCE OF YOUNG MEN. *J. appl. Physiol.*, Sept. 1965, 20(5), 1038-1040. (Physical Medicine & Rehabilitation, University of California School of Medicine, Los Angeles, Calif.).

The performance of 47 men was measured during a 16-week study. 8 of the men received placebos; 9 received 1-methyl- $\Delta^1$ -androstenolone acetate, an anabolic steroid; 15 received placebos and exercise; and 15 received the drug and exercise. There were no significant differences in strength, motor performance, or physical working capacity between the control and the androstenolone-supplemented groups. Differences in other factors such as vital capacity, limb circumference, and skin-fold thickness were also nonsignificant. Under the conditions imposed in this study there was no evidence that the anabolic steroid increased strength in young men.

R 9

27,772

Margaria, R., Aghemo, P. & Rovelli, E. INDIRECT DETERMINATION OF MAXIMAL  $O_2$  CONSUMPTION IN MAN. J. appl. Physiol., Sept. 1965, 20(5), 1070-1073. (Physiology Lab., University of Milano, Milano, Italy).

A nomogram is described for obtaining the value of maximum oxygen consumption per kg of body weight from the heart rate values observed at 2 submaximal work loads. The exercise consists in stepping up and down a 30- to 40-cm bench at a frequency dictated by a metronome. This procedure can be applied to all classes of Ss; the variability of the data obtained is within  $\pm 7\%$  with those directly determined.

R 10

27,773

Krishnaswamy, N., Mani, K.V. & Ranganathan, S. A HOT-WIRE MICROANEMOMETER FOR MEASUREMENT OF AIR MOVEMENTS INSIDE CLOTHING. J. appl. Physiol., Sept. 1965, 20(5), 1088-1090. (Defence Institute of Physiology & Allied Sciences, Madras, India).

A hot-wire anemometer has been specially designed and fabricated for the measurement of the wind speed component of the microenvironment inside clothing. A copper-constantan thermocouple has been used for estimation of temperature. The constant-current method is used for measurement of air movement. The sensing element is mounted in a Perspex frame which can be strapped to the human body inside clothing. Speeds in the range 2-280 cm/sec have been measured with the instrument.

R 4

27,774

Abbott, P.E. & Woodbury, J.R. JOINT ARMY-NAVY AIRCRAFT INSTRUMENTATION RESEARCH INVESTIGATION OF AUDITORY DISPLAYS. FINAL TECHNICAL REPORT. Contract Nonr 4335(00), Proj. RF 012 04 01, Rep. LB 32125, Jan. 1965, 110pp. Aircraft Div., Douglas Aircraft Company, Inc., Long Beach, Calif. (AD 613338)

A feasibility study was performed to examine the use of acoustic displays in aircraft longitudinal control. Emphasis was given to carrier landing. Initial experiments examined control compatibility of certain acoustic codes, together with their information carrying capability in representative noise. Frequency level and modulation characteristics were explored, together with compensatory and "pursuit" characteristics. Specific codes were compared, in a major carrier landing simulation, against conventional visual display techniques. Display quickening was introduced and evaluated. A pulse-frequency modulated code at low relative signal level and high relative frequency characteristics, was developed and tested during simulation for speed-angle-of-attack through stick and throttle manipulation, were examined. Dual channel acoustic presentation combining speed-angle-of-attack and height display were explored to a limited extent. Favorable conclusions concerning acoustic longitudinal control display emerged, together with indications for further research and development.

R 40

27,775

Gray, R., Teacher, C.F. & Yutz, R.W. SECURE COLOR VIDEO TECHNIQUES. ANNOTATED BIBLIOGRAPHY. VOLUME II. RADC TDR 64 339, Feb. 1965, 251pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (AD462529)

This extensive annotated bibliography contains general references and references relating to color cameras, color television systems, color video displays, perception, bandwidth compression, and storage problems. (HEIAS)

R many

27,776

Streimer, I. & Wendrow, B. THE IMPLICATIONS OF SPACE CREW PHYSICAL FITNESS MAINTENANCE TO SYSTEM DESIGN. J. Astronaut. Sciences, Spring 1965, 12(1), 27-29. (California State College, San Fernando, Calif.).

The necessity for space crew exercise has been previously discussed in the literature and the institution of mandatory exercise programs specifically designed to minimize the anticipated deleterious effects advocated. If for discussions sake we assume that exercise will maintain space crews in desired physical condition, 2 considerations arise which can drastically alter current concepts of system sizing and design. The first consideration stems from the question of how much exercise will be required per man day and the second from the question of whether exercise requirements increase with increasing mission duration. Since it is economically unfeasible to examine and predict every aspect of system change attributable to exercise requirements, examples have been selected which are believed to be both major factors in expendables calculations and representative of the anticipated changes. We presently have insufficient knowledge of space crew requirements to design systems economically. While the total weight changes required are only a small percentage of total system weights, the elements they represent drastically affect all aspects of manned missions. It seems logical to pursue further earthbound studies of the phenomena involved before continuing on with what may be unrealistic system designs.

R 26

27,777

Parks, G.M. EXTREME VALUE STATISTICS IN TIME STUDY. J. industr. Engng., Nov.-Dec. 1965, 16(6), 351-355. (Wharton School of Finance & Commerce, Penn.).

This article briefly reviews the literature and current practices for dealing with suspected abnormal time study observations; no standardized procedure was found and among those procedures practiced there was no statistical or logical basis. Quality control statistical procedures and 2 other methods requiring an a priori decision on what will be considered abnormal are briefly reviewed as suggested statistical procedures for treating outlying observations.

R 24

27,778

Dudek, R.A. & Petrino, M.J. INVESTIGATION OF AN OPERATOR'S VENTILATION RATE UNDER STATIC WORK LOADS. J. Industr. Engng., Nov.-Dec. 1965, 16(6), 368-376. (Industrial Engineering Dept., Texas Technological College, Lubbock, Tex. & USAF).

The effects of static work load was studied as a function of Ss ventilation rate (volume of expired pulmonary air expressed in liters/min.). The task was application of force to a lever arm; the independent variables were force applied (0, 5, 10 lbs.), angle of elbow flexion (100, 115, 130°), and distance of shoulder joint below point of application (5, 10, 15 in.). 6 female Ss served. The test session consisted of 3 consecutive 7 min. periods: rest, work, recovery. Ventilation rate was measured by a gasometer. A treatments X Ss factorial design was used; the analysis results showed the main effects of force, shoulder level, and period as significant at the 1% level, as well as several first order interactions. In general work load was found to have a significant effect upon physiological cost to the operator and that this effect varied with position.

R 18

27,779

Konz, S. & Redding, S. THE EFFECT OF SOCIAL PRESSURE ON DECISION-MAKING. J. industr. Engng., Nov.-Dec. 1965, 16(6), 381-384. (Kansas State University, Manhattan, Kan. & International Business Machines Corp., Armonk, N.Y.).

Decision-makers are influenced both by the facts and by social pressure operating on them, even for situations where the person does not realize he is under pressure. For a task which required judging the relative lengths of lines, Ss, 20 males and 20 females in 7-member groups (6 confederates 1 S), made the correct choice 85% of the time when not under social pressure vs 42% when the other members of the group selected an incorrect line, and 99% when the others selected the proper line. Thus, social pressure can enhance or degrade the quality of a decision.

R 8

27,780

Hillier, F.S. COST MODELS FOR THE APPLICATION OF PRIORITY WAITING LINE THEORY TO INDUSTRIAL PROBLEMS. J. industr. Engng., May-June 1965, 16(3), 178-185. (Stanford University, Stanford, Calif.).

The purpose of this article is to discuss and illustrate how to use waiting line (queueing) theory to analyze a wide range of industrial problems, especially those involving decisions regarding the amount of capacity to provide. Cost models, an example, and a discussion of how to determine the relevant costs are presented to give detailed guidance on how to conduct such an analysis. Special consideration is given to the case where priorities are used in selecting members of the waiting line for service, and a survey of the available results for waiting line models of this type is briefly presented.

R 28

27,781

Covert, R.P. THE ELECTRONIC POSITION INDICATOR. J. industr. Engng., July-Aug. 1965, 16(4) 255-259. (Industrial Engineering Dept., University of Missouri, Columbia, Mo.).

The Electronic Position Indicator is a radar-like device for the study of hand motions. First, a rederivation of the theory is presented to show its application to this situation. Then, the accuracy of the positional information expected from the theory is demonstrated. Finally, an investigation of motion paths is examined with the expectation of obtaining useful information about motion paths and their time derivations.

R 8

27,782

Beuter, R.J. & Drul, A.B. AN INDUSTRIAL ENGINEERING SITUATION--AN ACTION MAZE. J. industr. Engng., July-Aug. 1965, 16(4), 260-266. (Boeing Company, Seattle, Wash. & University of Washington, Seattle, Wash.).

The programmed instruction method is applied to a typical Industrial Engineering problem. Development, advantages, and examples of programmed learning techniques are discussed, as well as criteria for a successful program. The reader is invited to participate by solving a wage incentive program installation problem by the programmed instruction technique. This article uniquely combines material on the programmed instruction technique, a case problem in Industrial Engineering, and reader participation.

R 5

27,783

Hines, W.W. & Moder, J.J. RECENT ADVANCES IN SYSTEMATIC ACTIVITY SAMPLING. J. industr. Engng., Sept.-Oct. 1965, 16(5) 295-304. (Georgia Institute of Technology, Atlanta, Ga. & University of Miami, Coral Gables, Fla.).

Past accomplishments are reviewed and some recent developments are presented in the theory and methods of fixed interval or systematic activity sampling. Measures for describing population structure are developed, and the theoretical basis for systematic sampling designs is developed with estimators given. Results of the application of the systematic designs to 10 industrial activities are briefly described.

R 21

27,784

Goldman, J. & Hart, L.W., Jr. INFORMATION THEORY AND INDUSTRIAL LEARNING. J. industr. Engng., Sept.-Oct. 1965, 16(5), 306-313. (North Carolina State University, Raleigh, N.C. & Socony Mobil Oil Company, Inc., New York, N.Y.).

This experiment examined the effect of information presentation mode and task information content level on an operator's learning rate. 18 industrial electronics students served. 3 typical production electronic assembly tasks were selected: 67, 127, 440 information bits. 3 instruction modes were tested: blueprint, process sheet, and audio-visual. A 3 x 3 factorial design with 2 replications was used. The data consist of time from initial trial to standard operator time plus an additional ANOVA using cumulative learning time halfway to the standard time. The Newman-Keuls procedure was used to examine the difference between treatment means. Information content and instruction mode were significantly different in terms of learning rate. The individual comparisons showed no instruction mode superior for the 67 bit task; the process sheet mode superior for the 127 bit task, and the audio-visual for the 440 bit task. (HEIAS)

R 8

27,785

Das, B. APPLYING PROGRAMMED LEARNING CONCEPTS TO INSTRUCT IN PERFORMANCE RATING. J. Industr. Engng., March-April 1965, 16(2), 94-100. (University of North Carolina, Chapel Hill, N.C.).

The purpose of this investigation is to determine if the benefits of the programmed learning concepts can be extended successfully to develop the training procedure systematically and logically for instruction in performance rating. The experimental results showed that the students trained by the programmed learning method rated more consistently and accurately than the students trained by the conventional method. The difference in the consistency and accuracy levels between the 2 groups was significant at the 1% and 5% levels, respectively.

R 10

27,786

Hill, L.S. COMMUNICATIONS, SEMANTICS, AND INFORMATION SYSTEMS. J. Industr. Engng., March-April 1965, 16(2), 131-135. (Cost Analysis Dept., Rand Corporation, Santa Monica, Calif.).

The causes and effects of semantic difficulties in human communication are the joint subjects of this presentation. The focus is on some important implications of semantic problems to management planning and control systems. The first part of the analysis is directed toward an investigation of psychological considerations in semantics. The next part of the study is an attempt to indicate, by means of examples, using PERT Cost as a frame of reference, the dependency of modern management information systems on semantic factors. The final section of the article is concerned with possible approaches toward mitigation of semantic difficulties in the management field.

R 8

27,787

Moodie, C.L. & Young, H.H. A HEURISTIC METHOD OF ASSEMBLY LINE BALANCING FOR ASSUMPTIONS OF CONSTANT OR VARIABLE WORK ELEMENT TIMES. J. Industr. Engng., Jan.-Feb. 1965, 16(1), 23-29. (Industrial Engineering School, Purdue University, Lafayette, Ind.).

The research reported in this article was concerned with the development of a heuristic method of assembly line balancing which could be utilized with either constant or variable work-element time values. Features of method follow: a) As opposed to exhaustive enumeration, it evaluates only one (and often the best) of many possible permutations of a precedence diagram. The time required for a manual solution to a large problem is within the limits of practicality, and a computer solution is rapid, even for extensive problems; b) It consists of 2 phases: phase 1 attempts to assign work elements so as to obtain a minimum number of stations for a given amount of work and selected cycle times; phase 2 attempts to reduce the balance delay which results from the output of phase 1, and distribute the idle time equally to all stations. If, during the phase 1 assignment of stations, it becomes apparent that a minimum station balance is unattainable with the given cycle time, the cycle time is successively incremented by one time unit, up to a specified limit, as an aid in obtaining a minimum station balance; c) Work-element variance can be included as a pertinent factor in achieving an assembly line balance. This should result in a superior balance because the inherent variance of the work elements is a determining factor in assigning elements to stations; d) The logic of the method lends itself readily to computer programming. Large problems can be solved without zoning, because it is not necessary to utilize the large, square precedence matrix common to other line balancing techniques.

R 12

27,788

Burton, J.R. AN INCENTIVE FOR OPERATORS WHOSE PRODUCTION IS MACHINE CONTROLLED. J. Industr. Engng., Jan.-Feb. 1965, 16(1), 56-58. (Line Material Industries, Milwaukee, Wisc.).

The quality of castings in an iron foundry depended upon the care with which 7 ingredients were weighed into the cupola charge. An incentive based on the accuracy of the charge formulation provided additional income for the operators and improved quality for management. It is suggested that there are additional areas for the application of incentives other than time measurements.

27,789

Fellenz, L.E. THE SILENT WEAPONS. Ordnance, May-June 1965, 49(270), 610-612. (USA Office of the Assistant Chief of Staff for Force Development, Washington, D.C.).

Chemical and biological weapons are primarily area weapons. They will travel around corners, diffuse throughout woods and forests, and penetrate into dugouts and fortifications. They offer a gradation of effects from mild temporary illness to severe physiological damage and death. For the most part, they are colorless, odorless, and tasteless. The first indication of their use could be the appearance of casualties among those exposed. They are weapons of minimum destruction to physical facilities. 2 classes of chemical agents are discussed: the extremely lethal nerve agents and the nonlethal incapacitating agents. The paper concludes with a discussion, modes of defense against the use of chemical and biological agents.

27,790

Wing, R.D. ROAD TO COSTAR. Ordnance, July-Aug. 1965, 50(271), 77-79.

This article briefly reviews the history of logistical support services from the Army. The system, COSTAR (Combat Service to the Army), is then described. It is currently being implemented, and will completely realign the support elements of the field Army. Personnel functions and group services are enumerated. (HEIAS)

27,791

Hedlund, E.C. WHEN TO UNPACKAGE? Ordnance, Sept.-Oct. 1965, 50(272), 205-206. (USAF Warner Robins Air Materiel Area, Robins AFB, Ga.).

The question is discussed: when is the proper time to unpack an item. Past practices, basic considerations, and current techniques are considered relative to their role in the unpacking decision. Packaging designs, special instructions, and education of relevant personnel were some areas indicated for future action.

27,792

Polk, L. INCH VS. MILLIMETER. Ordinance, Nov.-Dec. 1965, 50(273), 296-299. (Measurement Science Center, George Washington University, Washington, D.C.).

This article refers briefly to the Report of the United States Department of Commerce Panel on Engineering and Commodity Standards which is a wide-ranging analysis and study of the United States standards and measurement systems covering the group, methods, and techniques involved, plus some long-range implications as well as immediate recommendations. It is a successor to the United States Department of Commerce Kelly Report of 1960. We also discuss a Task Force Measurement Systems Report (covering the Inch System and Systems International Metric).

27,793

Stone, H.A.G. SAFETY WITH LASERS. Ordinance, Nov.-Dec. 1965, 50(273), 315-318. (New York University, N.Y.).

This article describes the characteristics of lasers relative to ordinary sources of light and charts the relationships between various laser outputs and the visible electromagnetic spectrum. Some principal findings from studies on the biological effects of laser radiation are briefly mentioned. And a list of precautions suggested as a minimum for all personnel operating or working with laser devices is presented.

27,794

Moffett, T.J. AUTOMATED ENGINEERING. Ordinance, Nov.-Dec. 1965, 50(273), 322-324. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

This article portrays the function of the design engineer in the near future when he and the computer will be partners--"employing a graphic-based geometric language, a light pencil, a cathode tube, and stored data, the man/machine design team will produce an analysis model and its documentation simultaneously."

27,795

Sandberg, H.J. ALTIMETRY ASPECTS OF AUTOMATIC ALTITUDE REPORTING. J. Aircraft, May-June 1965, 2(3), 166-170. (Kollsman Instrument Corporation, Elmhurst, N.Y.).

The purpose of automatic altitude reporting is to reduce the amount of communication between the pilot and the controller. Nowhere in the recommendations for Project Beacon is better altitude measuring equipment, nor means for obtaining better vertical separation, recommended. An analysis of the accuracies to be expected, both in altimetry and in the automatically reported altitude, shows that systems installed under current rules and regulations could cause more communication between the controller and the pilot than now exists. This is because the combined tolerances of the altitude reporting equipment and of the current altimeters are such that one could even question the now-legal separations that are used. The conclusions are that certain ground rules must be established to make the program of automatic altitude reporting a success. These are a) the tolerances for altimetry systems must be considerably tightened; b) the pilot must fly the same altitude information that is being reported; c) the controller must be educated to the fact that instruments do have errors; and finally, d) the criteria governing vertical separation should be carefully examined.

R 2

27,796

Cook, R.H. AN AUTOMATIC STALL PREVENTION CONTROL FOR SUPERSONIC FIGHTER AIRCRAFT. J. Aircraft, May-June 1965, 2(3), 171-175. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

A number of supersonic fighter aircraft exhibit a tendency to "pitch up" as a result of reaching a full-stall condition. Recovery from the maneuver may be difficult and at higher speeds structural loads may be encountered which are beyond design limits of the aircraft. The flight test development program of an automatic system designed to protect the pilot and airframe from these undesirable characteristics is described. The system senses aircraft pitch rate and angle of attack and actuates a stick-shaker warning device followed by application of a corrective pitch control force if the warning is ignored and unsatisfactory conditions persist. Safety aspects of the test techniques were of paramount importance. The techniques developed for evaluation of system performance consisted of flights with lowered system boundary limits, 1-g stall approaches, wind-up turns, and rapid pull-ups. Tests were conducted with emphasis on reliability and system repeatability. A problem involving pilot-system interaction which caused cycling of the force system was solved by use of a minimum-time-on-delay. Minimum reduction in maneuvering boundary was achieved by addition of a pitch-rate washout. System block diagrams and performance data are presented for several stages of development including the final system. Preflight and inflight checkout procedures to verify system operation are described, as well as design and switching considerations, which improve performance, reliability, and safety.

27,797

Simpson, R.W. ANALYTICAL METHODS OF RESEARCH INTO TERMINAL AREA AIR TRAFFIC OPERATIONS. J. Aircraft, May-June 1965, 2(3), 185-193. (Massachusetts Institute of Technology, Cambridge, Mass.).

The application of mathematical models of various suboperations in the terminal area, and the use of fast time simulation on a digital computer to study the operation of a complete terminal area traffic control system, are briefly demonstrated. Mathematical models are used to analyze the capacity of race track holding patterns, the laddering operation, and the instrument landing system (ILS) funnel with time separations at the gate. The results of a fast time simulation on an IBM 7094, for an advanced method of providing sequencing and spacing for a single ILS runway are given. The landing system demonstrates a capacity of 32 landings/hr, along with runway availability for 20 takeoffs.

R 11

27,798

Miller, D.P. & Clark, J.W. RESEARCH ON VTOL AIRCRAFT HANDLING QUALITIES CRITERIA. J. Aircraft, May-June 1965, 2(3), 194-201. (United Aircraft Corporation, East Hartford, Conn.).

Analytical and flight simulator studies were conducted to examine the effects on selection of optimum longitudinal control sensitivity of: a) the oscillatory mode of dynamics; b) the stability derivatives  $M_y/I_y$ ,  $X_u/m$ , and  $M_{\dot{u}}g/I_y$ ; and c) the level of turbulence. An improved method for presenting handling qualities criteria was developed which permits construction of the optimum longitudinal control sensitivity line on a plot of pitch rate damping vs longitudinal control sensitivity (i.e., Tapscott's form of presentation) for any aircraft for which  $X_u/m$  and  $M_{\dot{u}}g/I_y$  are known or can be estimated. In this method a constant slope is assumed for the optimum line; for each of 3 reference levels of turbulence, contours of constant intercept with the zero-damping axis are presented on the  $X_u/m$  vs  $M_{\dot{u}}g/I_y$  plane, and contours of constant Cooper pilot rating are presented on the  $M_y/I_y$  vs  $M_{\dot{u}}g/I_y$  plane for 3 values of  $X_u/m$ . Predictions of the optimum longitudinal control sensitivity line made using contours established in the United Aircraft Corporation (UAC) flight simulator are in good agreement with published flight-test data for the NASA X-14A VTOL research airplane and the Princeton HUP-1 variable stability helicopter.

R 10

27,799

Mueller, L.J. PROBLEMS UNIQUE TO VTOL AUTOMATIC FLIGHT CONTROL. J. Aircraft, Sept.-Oct. 1965, 2(5), 357-360. (Honeywell Incorporated, Minneapolis, Minn.).

The automatic flight control system is a desirable aid to the handling qualities, stability augmentation, and safety of the present day VTOL aircraft. This has been verified in recent flight tests of the VJ101C VTOL built for the German Defense Ministry. Flight and simulator experience gained on this program emphasizes the need for stability augmentation in at least the pitch and roll axes. Other features, such as control stick steering and engine failure protection, were also provided. Since some of the flights were performed on a telescopic simulator, the range of control parameters could be expanded to permit a wider range and better separation of the control variables. All 3 phases of the VJ101 program as well as 3 distinct prototypes are described.

R 1

27,800

Grande, D.L. & Showalter, N.D., Jr. SOME EFFECTS OF STABILITY ON LOW-ALTITUDE RIDE QUALITY. J. Aircraft, Sept.-Oct. 1965, 2(5), 379-383. (Boeing Company, Renton, Wash.).

High-speed low-altitude missions subject the crew and the subsystems to an extremely severe vibration environment. The integration of the flight crew into the weapon system requires consideration of the cockpit displays, the navigation and target acquisition subsystems, the automatic control systems, and the dynamic characteristics of the airframe and flight controls. The aeroelastic response of a long-range strategic type of airplane is analyzed to illustrate some of the considerations that must be included in designing for low-altitude flight. The effect of changes in stability characteristics on dynamic response is calculated, and the effects of the changes on the subjective discomfort of the crew are evaluated. The results indicate that significant improvements in ride quality can be achieved through modifications to the stability characteristics of the airplane and illustrate the considerations required to improve weapon system effectiveness.

R 4

27,801

Johnston, G.W. SOME RECENT AERODYNAMIC ADVANCES IN STOL AIRCRAFT. J. Aircraft, Sept.-Oct. 1965, 2(5), 390-397. (deHavilland Aircraft of Canada, Ltd., Downsview, Ontario, Canada).

A brief review is presented of the results of some of the developments carried out recently by the de Havilland Aircraft of Canada Ltd., in 2 broad areas: a) basic STOL performance; and b) low-speed control and handling. In connection with basic STOL performance, the case for the classical STOL deflected slipstream configuration and some of its limitations are reviewed. Some evolutionary improvements to this basic design approach are outlined. In addition, the possibility of replacing the classical propeller installation with a true jet STOL aircraft is briefly discussed. Some improvements in longitudinal low-speed control are discussed. Other criteria are reviewed and some observed inherent limitations noted. Finally, the flight-test results obtained with an experimental aircraft incorporating a modified longitudinal control system are discussed.

R 11

27,802

Foss, R.L., Magruder, W.M., Litrownik, I. & Wyrick, D.R. LOW-SPEED AERODYNAMIC CHARACTERISTICS OF THE DOUBLE-DELTA SUPERSONIC TRANSPORT. J. Aircraft, Nov.-Dec. 1965, 2(6), 470-477. (Lockheed-California Company, Lockheed Aircraft Corp., Burbank, Calif.).

Extensive tests of the double-delta supersonic transport (SST) show that unique low-speed aerodynamic characteristics are inherent using this concept, and the double-delta transport will offer low-speed handling qualities and safety of operation that will surpass the levels of current jet transports. Flow visualization studies show coiled vortex sheets that increase in strength with increasing angle of attack and provide steady unseparated flow well beyond the range of practical flight attitudes. The double-delta wing does not experience lift stall, pitch-up, or increase in drag due to stall. Lateral control power is retained and directional stability increases with increase in attitude. These favorable aerodynamic characteristics lead to a simple, conventional control system and an airplane that is simple to operate, displaying excellent stability, control, and safety margin characteristics. Abused takeoff procedures are less critical than for current jets because of greater lift and rate of climb margins. Lateral control power provides favorable aileron response during approach and landing. Ground effect simplifies the flare maneuver prior to touchdown. Directional and lateral control characteristics combine to provide excellent cross-wind landing characteristics. Achievement of these characteristics using a simple fixed geometry wing is one of the attractive features of the double-delta SST.

R 1

27,803

Gallagher, J.T. & O'Donnell, F.B., Jr. INVESTIGATION OF THE APPLICATION OF DIRECT TRANSLATIONAL CONTROL TO VTOL AIRCRAFT. J. Aircraft, Nov.-Dec. 1965, 2(6), 538-545. (Northrop Corporation, Hawthorne, Calif.).

The possibility of employing a mixed translation and attitude control system through a single cockpit stick has been investigated for low-speed flight control of VTOL aircraft. In this way it would be possible to command more directly low-speed longitudinal and lateral translations and to reduce the amount of installed thrust required for attitude control of VTOL aircraft. The maneuvering translation concept is not to be confused in the longitudinal plane with the more gross thrust vectoring requirement necessary for transition to wing-borne flight. In the current study, combined control schemes were evaluated on the longitudinal axis of a simulated VTOL aircraft during performance of a multi-axis IFR (instrument flight rules) hover task. With pilot opinion as a measure, some combinations of attitude and translational controls were found to be more satisfactory than attitude controls alone. Systems receiving the best ratings were a) fully stabilized airframe provided with direct translation acceleration control and b) stick steering control of attitude with open-loop shaping of the translational control to give pseudo-velocity control. Acceptable translational controls seem particularly well suited to IFR hover tasks, since they allow control movements to be minimized. There were definite indications that the larger control movements associated with VFR (visual flight rules) flight, where the pilot is less inhibited by the instrument scanning process, would result in mismatching of the attitude and translation controls.

R 4

27,804

Hogan, E.T. & Nadeau, R.L. OPERATIONAL CONCEPT OF THE INTEGRATED HELICOPTER AVIONICS SYSTEM. J. Aircraft, Nov.-Dec. 1965, 2(6), 546-550. (Texas Instruments Incorporated, Dallas, Tex.).

This paper briefly describes an effectiveness model derived to compare the value of various alternative avionics subsystem configurations in terms of performance and cost. The sensitivity of an operational model of a Marine expeditionary force to the parameters of avionics system effectiveness provide a measure of the avionics impact on the total force levels. The integrated helicopter avionics system (IHAS) provides independent all-weather point-to-point navigation, terrain avoidance, and station-keeping for assault helicopter/VTOL during amphibious operations and subsequent combat operations ashore. This mission is accomplished with an integrated avionics system employing advanced sensors, a digital computer central complex, and microelectronic integrated circuits. Highlights of the program include the concept of system integration, functional modularity in design with microelectronic integrated circuits, and built-in test equipment. The approach described in this paper is based on a normalized task analysis that should be general enough to have wide application.

R 3

27,805

Elderkin, C.D. & Bradford, J.M. A LARGE ULTRAHIGH-VACUUM ENVIRONMENTAL CHAMBER WITH LIQUID-HELIUM-COOLED LINER. J. environ. Sci., Dec. 1965, 8(6), 11-15. (RCA Service Company, Camden, N.J. & Langley Research Center, NASA, Langley Field, Va.).

The Langley ultrahigh-vacuum system is diagrammed and described. It is basically a triple-walled system in which the outer chamber is a conventional vacuum vessel. The inner chamber can be cooled to liquid-nitrogen temperature and is essentially vacuum tight. The helium panel (cryogenic wall) used inside the inner chamber is cooled to liquid-helium temperature. The space within the inner chamber is pumped by 4 35-in diffusion pumps, and the annular space between the outer chamber and the inner chamber is pumped by a single 20-in diffusion pump. A helium refrigerator/liquefier supplies helium to the cryowall. Major components of the vacuum facility and the helium refrigerator are shown. The control console (second-floor level) contains the controls and instrumentation necessary for monitoring and operating the vacuum system and helium refrigerator. The motor control center (first-floor level) contains the circuit breakers for the various electrical components. 2 of the liquefier components are shown. The box-shaped component contains the heat exchangers necessary for precooling the incoming helium to liquid-nitrogen temperature, and the cylindrical component contains the expansion engine cylinders and the apparatus necessary to liquefy the helium. The only major component not shown is the 600-horsepower, nonlubricated helium compressor. A detailed discussion of each of the components of the vacuum system is presented.

27,806

Nathan, P.E. & Wallace, W.H. AN OPERANT BEHAVIORAL MEASURE OF TV COMMERCIAL EFFECTIVENESS. J. Advert. Res., Dec. 1965, 5(4), 13-20. (Psychiatry Dept., Harvard Medical School, Boston, Mass.).

This paper reports on a developmental study of a new laboratory technique designed to be a direct and immediate measure of a prime component of television commercial effectiveness--reinforcement value or, simply, interest or liking--measured by the rate at which Ss will perform work in order to look at and listen to commercials. The researcher who uses this method relies on neither recall information nor subjective viewer evaluation of commercials, to make judgments about a S's preferences among several television commercials. Rather, he anticipates the predictable capacity of television commercials to generate diverse quantities of looking and listening in representative television audiences. In so doing, he assumes that a commercial which induces more looking and listening behavior than other commercials is a more effective commercial because it is more reinforcing to its viewers. The major results of the study indicated that laboratory Ss' willingness to work to see and hear television commercials correlated highly with recall of the same commercials as measured in the field.

R 18

27,807

Byham, W.C. & Perloff, R. RECALL OF PRODUCT PURCHASE AND USE AFTER SIX YEARS. J. Advert. Res., Sept. 1965, 5(3), 16-19. (J.C. Penney Company, Inc., New York, N.Y. & Purdue University, Lafayette, Ind.).

This study provides 3 lessons for the consumer researcher: a) It points out once again the considerable unreliability in self-administered questionnaire responses. In the extreme case noted, only 37% of the respondents gave the same answer after a 2-month period when asked again about radio listening time per day in 1962; b) Quasi-longitudinal studies depending on recall may be effectively used in research for some types of subject matter. Situations where accurate recall is obtained from 70 to 80% of the population would probably be acceptable to most investigators--particularly if there was no alternative approach; c) Respondents' self-estimates of accuracy of memory do not appear to be worthwhile indicators of their actual accuracy of memory. Undoubtedly, the low correlations between actual and estimated accuracy are due in part to the severe restriction in range of responses in the memory estimate. When almost everyone checks 1 of the top 2 categories in the memory estimate, there is little with which accuracy could be correlated. Perhaps more sensitive and discriminating scales could be constructed for assessing this kind of memory phenomenon.

R 11

27,808

Banks, S. ON METHODS: LATIN SQUARE EXPERIMENTS. J. Advert. Res., Sept. 1965, 5(3), 37-46. (Leo Burnett Company, Inc., Chicago, Ill.).

Because of its ability to control directly 2 major sources of variation, the Latin square is perhaps the most frequently used experimental design encountered in statistical literature. The cases here indicate the substantial gains in experimental precision which this design often produces. In addition to direct experimental controls, the researcher is often able to use the statistical controls of the analysis of covariance to improve the precision of his experimentation. The author believes that the analysis of covariance will be extremely helpful to the researcher conducting advertising experiments with market areas as test units. He cannot control or forecast the advertising effort of his competition; however, accidental or deliberate variations in competitive activity either may distort estimates of his treatment effects or substantially increase the experimental error. The analysis of covariance technique can also be used to adjust for variations in economic conditions or other significant quantitative variables which meet the assumptions of a covariate.

R 5

27,809

Chapanis, A. COLOR NAMES FOR COLOR SPACE. Amer. Scientist, Sept. 1965, 53(3), 327-346.

The author poses the question of, what is the maximum number of usable color names for all of color space? It was estimated that the human eye can discriminate about 7,000,000 different colors on a 3-dimensional color space including variations of hue, lightness, and saturation. Differences between comparative and absolute judgments of color are discussed. Experiments on the denotative meaning of various color names are described. It was shown that color names which appear to be different are, for all practical purposes, synonymous. Also, that people do not make distinctions between certain modifiers which appear to convey the idea of variations in saturation and lightness. It was estimated that there are probably between 52-55 usable color names for all of color space.

R 25

27,810

Gebhard, J.W. DATING HUMAN MEMORIES BY HYPNOSIS. 1965, 56pp. Applied Physics Lab., Johns Hopkins University, Silver Spring, Md. (AD 627440)

The purpose of this review was to assess the experimental data that have been collected on recovering remote memories by hypnosis in order to form an estimate about the age and condition of the memory material that may exist in the neural store of an adult. The genuineness of hypnotically-induced age regression is a much debated theoretical matter. There can be no doubt that some old memories are revealed by hypnotic age regression just as some are recovered during well-motivated efforts to recall in the waking state. The fundamental question is: which state is superior? It was concluded that there is nothing in the data to uphold the view that specific memory patterns may be unfolded with precision by hypnotic means. This is to say that there is nothing to show that memory systems are filed temporally in layers, impervious to the ravages of time. (HEIAS)

R 97

27,811

Reid, L. THE DESIGN OF A FACILITY FOR THE MEASUREMENT OF HUMAN PILOT DYNAMICS. UTIAS Tech. Note 95, June 1965, 67pp. Aerospace Studies Institute, University of Toronto, Toronto, Ontario, Canada. (AD 627570)

This report describes the modification of the UTIAS CF-100 flight simulator and the development of a data analysis technique in order to study human operators in a realistic flight environment. The operator forms part of a closed loop system which may consist of 1 or 2° of freedom. A method of analyzing data obtained from short record runs is presented which is similar to the well known cross-correlation, cross-power spectral density method.

R 56

27,812

Raffel, J.I. SEMI-ANNUAL TECHNICAL SUMMARY REPORT TO THE ADVANCED RESEARCH PROJECTS AGENCY ON GRAPHICS. 1 JUNE-30 NOVEMBER 1965. Contract AF 19(628) 5167, Proj. ARPA Order 691, ESD TDR 65 561, Dec. 1965, 8pp. Lincoln Lab., Massachusetts Institute of Technology, Lexington, Mass. (AD 625567)

Recent efforts in the Graphics Program have concentrated on the development of a Graphical Service System, display routines compatible with the new time-sharing system, APEX, and a universal translation, VITAL, which will be used to generate a graphical compiler. Programs for clipping and approximating conic segments have been developed and initial experiments which apply graphical techniques to procedure description have been attempted.

R 6



27,813

Morrisette, J.O., Pearson, W.H. & Switzer, S.A. A MATHEMATICALLY DEFINED TASK FOR THE STUDY OF GROUP PERFORMANCE. Human Relations, May 1965, 18(2), 187-192. (Tavistock Institute of Human Relations, London, England). (Reprint) (AD 627424)

A task was developed for the purpose of studying group performance in communication nets. Characteristics of the task are: a) an objective solution; b) replicability with unique solutions, while task difficulty and workload may be kept quantitatively constant; c) task difficulty and workload which may be varied independently; d) group size variation, while task properties may be kept constant or varied; and e) quantitatively described task elements such that the elements assigned to each group member may or may not be kept quantitatively equal. H, the Shannon-Wiener measure of information in a set of elements, was investigated as an indicator of task difficulty. Solution times linearly proportional to H were obtained. R 12

27,814

Hollander, E.P., Julian, J.W. & Haaland, G.A. CONFORMITY PROCESS AND PRIOR GROUP SUPPORT. J. Pers. Soc. Psychol., 1965, 2(6), 852-858. (New York State University, Buffalo, N.Y.). (Reprint) (AD 627580)

A 2-phase experiment on conformity process was conducted with 76 women and 36 men. In same-sex groups, Ss were presented with 1 of 3 conditions of prior group support before confronting erroneous judgments apparently given by 4 other group members. In the 1st phase, Ss responded to an unambiguous stimulus for 20 trials as the 1st person to report in a standard Crutchfield situation. The 3 support conditions involved uniform agreement from the group on 20 out of 20 trials, 14 out of 20 trials, or 10 out of 20 trials; a control condition had no feedback from others. Ss then shifted to the usual last response position for 20 more trials on which it now appeared that the other group members were responding directly opposite to accurate perception of the same unambiguous stimulus. Initial and sequential conformity were found to differ significantly as a function of the 4 treatments. As predicted, total conformity and a postinteraction measure of dependence were significantly correlated. Sex differences in total conformity were also noted, with the women being significantly higher overall. R 24

27,815

Foulke, E. ELECTRIC SPARK STIMULATION OF THE SKIN. Contract DA 49 193 MD 2525, Nov. 1965, 27pp. Performance Research Lab., University of Louisville, Louisville, Ky. (AD 624848)

Several years ago a technique was introduced which at least one authority considered to be "one of the best methods" for the careful study of the skin (Geldard, 1953). This technique (Bishop, 1943) allowed, presumably, single-unit stimulation of the skin, and at the same time avoided the necessity for actual contact with the skin. The method which Bishop employed involved stimulation of the skin with electric sparks generated by capacitor discharges. On the basis of the data presented here, it may be concluded that the technique devised by Bishop for exploring the skin's sensory mechanisms is not as simple and as straightforward as it at first appeared. In light of this investigation, it is probably advantageous to look elsewhere for a stimulus source. There are available commercially a number of electronic stimulator devices which are capable of producing single pulses of pulse trains with a considerable degree of control. It is probable that one of these devices, with its output applied to a suitably small area, would provide the needed tool for a truly fruitful exploration of a single sensory units of the skin. R 6

27,816

Elliott, E. ATTENUATING PROPERTIES OF ARL TUNED EARPLUGS. ARL/D/R22, SP Rep. 3/65, Nov. 1965, 19pp. Admiralty Research Laboratory, Teddington, Middlesex, England. (AD 478950)

This report presents pure-tone and speech attenuation characteristics of a family of sharply-tuned ear-plugs. These plugs offer advantages over conventional plugs for protection against narrow bands of noise. They may also be valuable as tools in general psycho-acoustic research. R 4

27,817

Magnolia, L.R. THE METEOROID ENVIRONMENT: A SELECTED BIBLIOGRAPHY. Spec. Lit. Survey 11, Rep. 9990 7156 KU 000, Nov. 1965, 15pp. TRW Space Technology Laboratories, Thompson Ramo Wooldridge, Inc., Redondo Beach, Calif. (AD 473661)

This bibliography contains 154 entries, alphabetically arranged. Time period coverage and manner of selection are not indicated. (HEIAS)

27,818

Weston, Louise B. SUNLIGHT, MOONLIGHT, AND TWILIGHT FOR ANTARCTICA 1966-1968. Circular 107, April 1965, 19pp. USN Observatory, Washington, D.C. (AD 626268)

This report consists of a large number of graphs which give data concerning the rising and setting of the sun and moon and the duration of twilight for high southern latitudes. These graphs are similar to the graphs in the Air Almanac for northern latitudes. The graphs are fully explicated.

27,819

Sands, H.J., Jr. (Chm.). PROCEEDINGS OF AIR FORCE/INDUSTRY DATA MANAGEMENT SYMPOSIUM. Sept. 1965, 328pp. USAF Ballistics Systems Div., Norton AFB, Calif. (AD 626032)

This document covers material presented at a symposium on data management. This is arranged by panel, as follows: data management concepts; acquisition of contractor data; rights in data and warranty; estimating data costs; new frontiers. (HEIAS)

27,820

Hewitt, J.S., Balkwill, J.S., Whiteside, T.C.D. & Whittingham, P.D.G.V. A PRELIMINARY STUDY OF FLIGHT DECK WORK LOADS IN CIVIL AIR TRANSPORT AIRCRAFT. FPRC 1240, Aug. 1965, 44pp. Flying Personnel Research Committee, London, England. (AD 476902)

16 scheduled transatlantic sectors were flown in BOAC Boeing 707 aircraft, each with an observer and a volunteer S--the aircraft captain. A continuous recording of the captain's heart rate was made on tape, together with a simultaneous commentary by the observer. At the same time the captain's total output of urine was collected in individual samples for subsequent biochemical analysis, which included adrenaline and noradrenaline. Cockpit environment and crew activities were also noted, as also was the captain's post flight 'fatigue state'. It was found that the pilots' heart rates showed changes that were associated with particular phases of flight and which varied with the circumstances under which the flights were made. The biochemical measurements reflected the unexceptional nature of the environments and the overall demand upon the pilots in these flights. The findings are discussed and the conclusion made that sufficient information has been obtained by these techniques to warrant their continued use in the next phase of the investigation.

R 15

27,821

Ashkenas, I.L. A STUDY OF CONVENTIONAL AIRPLANE HANDLING QUALITIES REQUIREMENTS. PART II. LATERAL-DIRECTIONAL OSCILLATORY HANDLING QUALITIES. FINAL REPORT. Contract AF33(657) 10407, Proj. 8219, Task 821904, AFFDL TR 65 65 138, Nov. 1965, 69pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Systems Technology, Incorporated, Hawthorne, Calif.). (AD 627989)

This report is a codification in 2 parts of conventional aircraft handling qualities criteria. The results of this effort are to serve as an intermediate design guide in the areas of lateral-directional oscillatory and roll control. The roll handling qualities portion of this report uses as a point of departure the concept that control of bank angle is the primary piloting task in maintaining or changing heading. Regulation of the bank angle to maintain heading is a closed-loop tracking task in which the pilot applies aileron control as a function of observed bank angle error. For large heading changes, the steady-state bank angle consistent with available or desired load factor is attained in an open-loop fashion; it is then regulated in a closed-loop fashion throughout the remainder of the turn. For the transient entry and exit from the turn, the pilot is not concerned with bank angle per se, but rather with attaining a mentally commanded bank angle with tolerable accuracy in a reasonable time, and with an easily learned and comfortable program of aileron movements. In the lateral oscillatory portion of this effort, in defining requirements for satisfactory Dutch roll characteristics, a fundamental consideration is the fact that the motions characterizing this mode are ordinarily not the pilot's chief objective. In spite of its distinction as a side effect, adequate control of Dutch roll is a persistent handling qualities research area and a difficult practical design requirement. Dutch roll damping requirements is to first establish the basic level, and then to study the varied influences of the disturbance parameters. This approach provides the basis for the material contained in this report.

R 44

27,822

Anderson, R.G. SURVEY OF THE ERRORS OF PRESSURE MEASURING INSTRUMENTS IN RELATION TO AIR TRAFFIC SEPARATION STANDARDS. Tech. Rep. 65262, Dec. 1965, 33pp. Royal Aircraft Establishment, Farnborough, Hants, England. (AD 478915)

A simple account is given of the accuracy of height and speed measurements in current types of aircraft. Estimates of the errors likely to be encountered at jet cruising levels are given together with an outline of the conditions which should be met before any reduction in separation standards can be justified.

R 24

27,823

Bass, B.M. & Wolpert, Susan. NORMS FOR A PROGRAM OF EXERCISES FOR MANAGEMENT AND ORGANIZATIONAL PSYCHOLOGY. Contract Nonr 624(14), Tech. Rep. 10, Jan. 1965, 28pp. USN Group Psychology Branch, ONR, Washington, D.C. (University of Pittsburgh, Pittsburgh, Penn.). (AD 627648)

Up to 119 graduate business students and 96 middle managers completed a set of 10 exercises in small groups. The normative distributions of results for each exercise are presented along with a description of each exercise and some inferences drawn about differences in behavior of managers and students faced with the same simulated organizational problems.

27,824

Bortell, P. & Hicks, J. WHITEOUT MODIFICATION EXPERIMENTS USING GROUND BASED SYSTEMS. DA Task IV014501B52A31, Spec. Rep. 85, Oct. 1965, 18pp. USA Cold Regions Research & Engineering Lab., Hanover, N.H. (AD 478907)

The CRICKET rocket system performed well and met all operational criteria. The adverse weather conditions common to Camp Century had no detrimental effect on the system other than to lower available launch pressures. A complete operational loading and charging chart, based on actual rocket performance, was made to ensure proper seeding altitudes on demand up to 3000 ft. A continuous firing rate of 1 loaded rocket per min was feasible with a crew of 2 men. Field repair and maintenance of the system was conducted by untrained personnel with a minimum of tools. The CRICKET is inexpensive and simple to operate, and appears to be an excellent vehicle for whiteout modification experiments; depending on further work on the effectiveness of seeding agents, it will probably provide an effective permanent ground-based whiteout dispersal system. The most promising of the seeding agents seem to be propane and dry ice. More work is also needed on a reliable means of observing the effects of seeding--some system of tracking the seeded area.

R 8

27,825

Chan, P.T. LOW ALTITUDE PENETRATION STUDY. PART II. EFFECTS OF ATMOSPHERIC TURBULENCE ON LOW ALTITUDE FLIGHT PERFORMANCE. FINAL REPORT. ONR Proj. LTV 493 49, LTV Rep. 2 55100/5R 50275, March 1965, 44pp. LTV Aeronautics Div., Ling-Temco-Vought Aerospace Corporation, Dallas, Tex. (AD 476704)

This is the 2nd of 3 final reports summarizing work done by the LTV Vought Aeronautics Division on a low altitude penetration study (LAPS). Pertinent problem areas investigated are: a) aircraft displacement by gust; and b) induced gust load factors experienced by the penetrator. The LTV-developed LAP model was used to simulate aircraft performance under various conditions of atmospheric turbulence.

R 4

27,826

Crannell, C.W., Switzer, S.A. & Morrisette, J.O. INDIVIDUAL PERFORMANCE IN COOPERATIVE AND INDEPENDENT GROUPS. Contract AF 33(616) 7132, Proj. 7184, Task 718403, AMRL TR 65 219, Oct. 1965, 6pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Miami University, Oxford, Ohio). (AD 627425)

A recently reported investigation showed that, in a learning task involving the recall of 100 3-digit numbers, 5-man cooperative (interacting) groups recalled significantly fewer items correctly than did 5-man independent (noninteracting) groups. However, the cooperative groups reported significantly fewer items incorrectly than did the independent groups. In terms of the total N items recalled, the cooperative groups (as compared with the independent groups) had a much larger proportion of correct responses. The objective of this investigation is to determine the effects of interaction and noninteraction on internal group processes, thereby providing a basis for a better understanding of group performance. We shall attempt to accomplish this objective by analyzing the performance of the best Ss and the poorest Ss in each group.

R 2

27,827

Dienemann, P.F. & Sumner, G.C. ESTIMATING AIRCRAFT BASE MAINTENANCE PERSONNEL. Contract AF 49(638) 66 C 0001, Memo. RM 4748 PR, Oct. 1965, 101pp. Rand Corporation, Santa Monica, Calif. (AD 626087)

This is a discussion of methods for estimating aircraft base maintenance personnel requirements. Maintenance personnel are divided into 3 functional categories: direct maintenance, maintenance overhead, and other maintenance. A series of relationships is developed for the first category to estimate personnel requirements (man-hours per flying hour) for advanced aircraft based on the design and performance characteristics. Requirements for maintenance overhead are derived from these estimates. The Memorandum summarizes the techniques, using current USAF manning procedures, that can be used to estimate all other maintenance personnel.

R 2

27,828

Robinson, Jane J. THE TRANSFORMATION OF SENTENCES FOR INFORMATION RETRIEVAL. Report from: "1965 Congress of International Federation for Documentation (FID), Washington, D.C. October 1965." Rep. P 3243, Dec. 1965, 13pp. Rand Corporation, Santa Monica, Calif. (AD 624890)

This paper considers the problem of finding a mechanical procedure for recognizing matching sentences, i.e., recognizing relevance and sameness of meaning at the sentence level regardless of formal differences. Such a procedure must be based on an understanding of the basic processes of sentence construction provided by the grammar of a language. A graph technique demonstrates the reduction of different surface structures in sentences with the same basic meaning to similar representative forms. Some current work on sentence analysis by various transformational grammars is indicated.

R 14

27,829

Oatman, Lynn C. TARGET DETECTION USING BLACK-AND-WHITE TELEVISION. STUDY I: THE EFFECTS OF RESOLUTION DEGRADATION ON TARGET DETECTION. AMCMS Code 5011.11841, Tech. Memo. 9 65, July 1965, 20pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 625231)

The probability of detecting an M-48 tank at 4 different levels of television (TV) resolution (800, 600, 400, and 300 lines) was investigated on a black-and-white closed-circuit TV system. The 4 levels of TV resolution were presented to 16 Ss, who were asked to indicate in which one of 9 areas the tank appeared on the TV screen. The data indicated that Ss performed about equally well at the 800, 600, and 400 levels of resolution; however, their performance was significantly poorer at the 300 level of resolution. The tank's location on the TV screen was an important factor in the probability of target detection, but was confounded with other variables.

R 8

27,830

Oatman, Lynn C. TARGET DETECTION USING BLACK-AND-WHITE TELEVISION. STUDY II: DEGRADED RESOLUTION AND TARGET-DETECTION PROBABILITY. AMCMS Code 5011.11.841, Tech. Memo. 10 65, July 1965, 20pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 625230)

This study used a black-and-white closed-circuit television (TV) system to investigate the effects of 2 levels of TV resolution (800 and 450 lines) on the probability that Ss would detect an M-48 tank. While a previous study used horizontal degradation only, this one degraded the TV image in both horizontal and vertical dimensions. The tank was shown in each of 9 areas of the TV screen, under both levels of resolution. 30 Ss observing the TV monitor were asked to indicate in which of the 9 areas the tank appeared. With changes in the horizontal resolution only, in the previous study, changing resolution from 800 to 400 lines did not affect target-detection probabilities significantly. But with both horizontal and vertical changes, Ss performed significantly better at the 800 level of resolution than at the 450 level. The tank's location on the TV screen, although confounded with other variables, appeared to have an important effect on target-detection probability.

R 5

27,831

Burnstein, E. & Zajonc, R.B. THE EFFECT OF GROUP SUCCESS ON THE REDUCTION OF STATUS INCONGRUENCE IN TASK-ORIENTED GROUPS. Sociometry, Dec. 1965, 28(4), 349-362. (University of Michigan, Ann Arbor, Mich.). (Reprint) (AD 628576)

Over a large number of trials observations were made to determine the rapidity with which a group responds to status incongruences and how such responses are influenced by its history of successes and failures. 2 dimensions of status are examined: the apparent task ability of a member (performance status) and his influence over the group product (control status). Incongruences were induced by making a member's performance status incommensurate with his control status. It was found that groups with a history of continuously successful outputs and those with a history of intermittent success restructure their hierarchies in order to reduce an incongruence in status ranks. However, this occurs more readily in the former condition than in the latter. Members experiencing large incongruences, especially when they possess the greatest control, tended to respond more rapidly to the need for optimal restructuring, except when this entailed their being severely downgraded.

R 10

27,832

Voiers, W.D., Cohen, Marion F. & Mickunas, J. EVALUATION OF SPEECH PROCESSING DEVICES. 1. INTELLIGIBILITY, QUALITY, SPEAKER RECOGNIZABILITY. FINAL REPORT, 1 JUNE 1964-31 JULY 1965. Contract AF19(628) 4195, Proj. 4610, Task 461002, AFRL 65 826, SRRC RR 65 94, July 1965, 151pp. USAF Cambridge Research Labs., Bedford, Mass. (Sperry Rand Research Center, Sudbury, Mass.). (AD 627320)

This study is concerned with the development of improved methods of evaluating experimentally processed speech and, in turn, speech-processing devices and systems. 3 bases of evaluation are dealt with in the study. These are: Intelligibility, Speaker Recognizability and Aesthetic Acceptability or Quality. A 2-choice diagnostic rhyme test for the transmission of consonant information has been developed. It yields a total intelligibility score plus diagnostic scores relating to the fidelity with which 7 binary attributes of consonant phonemes are transmitted to the ear of the listener. These attributes are voicing, nasality, duration and frication (as opposed to plosion), i.e., front (as opposed to middle) middle (as opposed to back) and back (as opposed to front). For treating the problem of speaker recognizability, procedures have been developed by means of which listeners' ratings of voices on various perceived acoustic traits can be analyzed to predict speaker recognizability under any given transmission condition. The problem of evaluating the aesthetic acceptability or quality of transmitted speech is treated by means of the standard unit-variance method. Primary emphasis is placed upon the contributions of the channel to the quality of the received speech. However, the method is adaptable for purposes of studying qualitative variation attributable to the source (i.e., the speaker). In this method, speech as processed by 4 representative vocoder systems provides standards with which experimentally processed speech is compared by listeners. Listener response data are analyzed to yield a value representing the position of the experimental system on a standard unit-variance scale of aesthetic acceptability. Results of evaluations of representative vocoders are presented for each of the 3 evaluation methods. R 46

27,833

Kennedy, R.S. & Berghage, T.E. PILOT ATTITUDES ON DARK ADAPTATION AND RELATED SUBJECTS. Spec. Rep. 65 4, June 1965, 7pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (AD 620016)

The night accident rate for carrier landings is 5 times the day rate. This raises the possibility that visual errors caused by lack of dark adaptation may be involved. Completed questionnaires regarding the importance of being adapted to darkness prior to and during night time aircraft carrier operations were received from 71 experienced naval aviators. Analysis of their responses showed that, generally, their opinion of the usefulness of dark adaptation is an individual matter; if the aviator had never experienced its need, he was less likely to be concerned. The greatest value to an aviator of being adapted to the dark was said to be during preflight operations, i.e., on deck, when moving to and around the aircraft, taxiing, and during launch. After being airborne, however, the aviator's major visual problem lies in reflection of the instrument lights which reduces visibility and can affect dark adaptation. Poor knee-board lighting and difference in instrument light intensity were mentioned as other irritating problems.

R 5

27,834

Rudner, Beulah. COMPRESSION OF ENGLISH TEXT BY INEXACT TRANSMISSION. Contract DA 31 124 ARO D 380, DA Proj. 20014501B04C, Tech. Rep. PIBMRI 1279 65, Aug. 1965, 15pp. USA Electron-ics Research & Development Agency, Fort Monmouth, N.J. (Polytechnic Institute of Brooklyn, Brooklyn, N.Y.). (AD 626843)

The subject treated is the compression of English text by means of inexact transmission, defined as transmission in which the sense but not the exact symbols of the input message are recoverable. Experimental results in compression by means of minimum redundancy coding are noted, and possible advantages of inexact transmission are discussed. 2 forms of inexact transmission were considered in particular: Basic English, and Reduced English. Some statistics on these 2 forms were collected and their word entropies were estimated.

R 6

27,835

Wayman, V.O. PROCEDURES FOR GUIDANCE AND REVIEW OF PRIME CONTRACTOR DEVELOPMENT OF PERSONNEL PLANNING INFORMATION. Contract Nonr 3949(00), Rcp. PTB 66 2, Dec. 1965, 62pp. USN Bureau of Naval Personnel, Washington, D.C. (Personnel Research Center, Inc., Detroit, Mich.). (AD 627326)

The guidelines for Bureau of Naval Personnel guidance and review of hardware contractor development of Personnel Planning Information presented in this report support the recommendations of the Bureau of Naval Personnel New Developments Human Factors Program. The guidance and review procedures have been designed for application to weapon and support systems in the RDT&E cycle under certain circumstances in which hardware contractor development of Personnel Planning Information would best meet the requirements of the Bureau of Naval Personnel. This report will be subsumed by the revision of the Bureau of Naval Personnel New Developments Human Factors Program which is currently in progress and is scheduled for completion by June 1966.

R 12

27,836

Sanders, J. DOCUMENT ASSOCIATION AND CLASSIFICATION BASED ON L-LANGUAGES. *J. Assoc. comput. Machinery*, April 1965, 12(2), 249-253. (University of Arizona, Tucson, Ariz.). (Reprint) (AD 623495)

Measures of document connectedness and association are defined based on a formal language structure. The properties and implications of these definitions are investigated and examples are given. The implications of the theory for automated document retrieval are discussed in conjunction with various extensions of the formal theory.

R 1

27,837

Mower, R.D. & Tierney, F.B. (Eds.). HANDBOOK FOR ELECTRONIC COUNTER-COUNTERMEASURES TRAINING IN SAGE. Contract AF 19(628) 3418, Tech. Memo. 1306/001/01, June 1965, 87pp. *Systems Development Corporation*, Santa Monica, Calif. (AD 469873)

This report describes procedures and materials for simulated ECCM training missions. Some of this information is relevant to live exercises. The report contains information and references regarding SAGE operational Long Range Radar (LRR) equipment, the Direction Center (DC) computer programs, the ECCM threat, ECM effects on SAGE and SAGE's ECCM capabilities. These technical areas represent an attempt to provide general information; specific details should be sought from the references. Although the main emphasis is upon SAGE, some of the material applies to manual and to other semiautomatic defense systems.

R Many

27,838

Hajos, A. & Ritter, M. EXPERIMENTS TO THE PROBLEM OF INTEROCULAR TRANSFER. *Acta psychol., Amsterdam*, June 1965, 24(2), 81-90. (Experimental Psychology Institute, University of Innsbruck, Innsbruck, Austria).

8 experiments with monocular occluding prism spectacles (14 prism diopters), and 7 experiments with binocular squint spectacles (10.5 prism diopters) were performed to investigate the following questions: a) Does the response of the covered eye change also, when changes occur in the prism eye? If so, does the covered eye mimic the prism eye in its changes? b) What is the result, when prisms are worn in opposite directions before the 2 eyes? Does each eye act independently, or does the effect in 1 eye inhibit the adaptation process in the other eye? The results with the monocular prisms show transfer of the effects of apparent curvature and spatial displacement, but the measurements of dispersion bands show no change which could be interpreted as transfer. The results from the experiments with squint spectacles show that each eye is able to develop its compensation for prismatic dispersion independently of the other eye.

R 13

27,840

Michon, J.A. STUDIES ON SUBJECTIVE DURATION: II. SUBJECTIVE TIME MEASUREMENT DURING TASKS WITH DIFFERENT INFORMATION CONTENT. *Acta psychol., Amsterdam*, June 1965, 24(2), 205-219. (Institute for Perception RVO-TNO, Soesterberg, The Netherlands).

The influence is studied of a multiple choice task on the production of time intervals of 2 subjective seconds. The stimulus uncertainty and the response uncertainty of this task were varied independently between 0 and 2.58 bit (1 to 6 alternatives). Successive stimulus presentations were independent. The results show that the amount of stimulus uncertainty does not influence the length of the produced intervals. Only the transition from the 1-alternative task ( $U[S] = 0$ ) to the multiple choice task ( $U[S] > 0$ ) reflected itself in a decrease in average interval length. Response uncertainty and transmission on the other hand had a marked influence: average interval length appears to be a decreasing and decelerating function of both response uncertainty and transmission. The results at first sight appear to be contradictory to numerous other investigations. The apparent discrepancy in literature is caused however by the lack of formal task descriptions, such as are possible by means of concepts like uncertainty or constraint.

R 11

27,841

Von Békésy, G. TEMPERATURE COEFFICIENTS OF THE ELECTRICAL THRESHOLDS OF TASTE SENSATIONS. *J. gen. Physiol.*, Sept. 1965, 49(1), Part 1, 27-35. (Psychophysics Lab., Harvard University, Cambridge, Mass.).

Each papilla in an enlarged photograph of the tip of the tongue was identified electrically as belonging to one of the 4 basic taste sensations. The temperature coefficient of the threshold for electrical stimulation was observed for single papillae. The results seem to divide the 4 basic taste sensations into 2 different groups: sour-salty and sweet-bitter. This is the same division that has been reported with other methods.

R 10

27,842

Guion, R.M. INDUSTRIAL PSYCHOLOGY AS AN ACADEMIC DISCIPLINE. *Amer. Psychologist*, Oct. 1965, 20(10), 815-821. (Bowling Green State University, Bowling Green, Ohio).

Industrial psychology is an academic discipline, a useful branch of general psychology, with specific values relevant to society at large. It is a part of general psychology, the science of behavior. Learning, motivation, perception, the physiology of energy expenditure, personality trait theory, developmental processes--all these topics and more are among the proper concerns of the industrial psychologist. In short, industrial psychology, and especially industrial psychology found in academic settings, should be engaged in research which may generalize far beyond the specific interests of specific managerial situations; it should seek methods of investigation that will approach the more significant problems of our time; and it should enjoy close communications with other specialties within the broad scientific field of psychology. Most of all, it should work toward systematizing into theory valid knowledge of work-related behavior. It will be on a foundation of a well-supported, highly generalizable scientific theory that the technology of professional practice will prosper most highly.

R 17

27,843

American Psychological Association. GUIDELINES FOR DOCTORAL EDUCATION IN INDUSTRIAL PSYCHOLOGY. Amer. Psychol., Oct. 1965, 20(10), 822-831. (American Psychological Association, Washington, D.C.).

The purpose of this report is to describe guidelines for doctoral education in industrial psychology. To this end, descriptions have been included to relate the history of the development of the guidelines and those principles used in developing them. The guidelines themselves deal with faculty competence, undergraduate background, graduate training, and practicum training. They outline the education which leads to minimum competence in the field and must be viewed, particularly and generally, in light of the authors' conviction that there is need for continuing education beyond the doctoral level if the profession wishes to maintain the distinction between mere competence and actual professional maturity.

R 8

27,844

Steege, A.T., Jr. A STUDY OF RELATIONSHIPS BETWEEN FACIAL COLD RESPONSE AND SOME VARIABLES OF FACIAL MORPHOLOGY. Amer. J. phys. Anthropol., Dec. 1965, 23(4), 355-362. (Anthropology Dept., University of Missouri, Columbia, Mo.).

An experimental pilot study was conducted to determine possible interrelationships between facial skin temperature, facial protrusion, and facial fat thickness; it employed 1° C cold air stress and thermocouple measurement of response. 11 Japanese and 15 white American males were tested. Variation in the colder facial temperatures after 90 min. of cooling could not be explained by morphological parameters, though the Japanese maintained significantly higher facial temperatures than did the Americans. The "hunting phenomenon" was possible involved, and the anthropological implications were briefly discussed.

R 10

27,845

Damon, A. STATURE INCREASE AMONG ITALIAN-AMERICANS: ENVIRONMENTAL, GENETIC, OR BOTH? Amer. J. phys. Anthropol., Dec. 1965, 23(4), 401-408. (Anthropology Dept., Harvard University, Cambridge, Mass.).

Among 199 Italian-American men, aged 20-59, over 90% American born of Neapolitan parentage and working in a single factory near Boston, stature increased progressively from the sixth to the third decade. The difference, 2.1 in. ( $p < 0.001$ ), is the largest yet reported for adults over so short a period. Most of the increase is environmentally mediated, but the possibility of heterosis is suggested by the greater stature of sons of exogamous matings than of endogamous matings (difference = 0.73 in.,  $0.06 > p > 0.05$ ), independently of age.

R 35

27,846

Savara, B.S. APPLICATIONS OF PHOTOGRAMMETRY FOR QUANTITATIVE STUDY OF TOOTH AND FACE MORPHOLOGY. Amer. J. phys. Anthropol., Dec. 1965, 23(4), 427-434. (Child Study Clinic, University of Oregon Dental School, Portland, Ore.).

This paper presents an objective method for quantitative, 3-dimensional description of tooth morphology using stereo-photogrammetry. Methods of tooth orientation, choice of best descriptive measurements and use of automatic data reduction facilities are discussed. Applications of the method to study soft tissues of the face and the underlying bones are also presented. (HEIAS)

R 23

27,847

Eisdorfer, C. VERBAL LEARNING AND RESPONSE TIME IN THE AGED. J. genet. Psychol., Sept. 1965, 107(First Half), 15-22. (Psychiatry Dept., Duke University Medical Center, Durham, N.C.).

This study was performed to determine whether increasing stimulus-exposure time in a learning situation helps the aged because of additional time to view the stimulus or whether some other factor secondary to a slower pace (e.g. more time to respond) is involved. On the basis of the present results it would appear that the aged can formulate and produce the simple response required comparatively rapidly. The deficit may lie in some factor relating to the older person's propensity to respond (or to withhold responses). Older Ss may require a greater degree of confidence in their judgment before responding. (HEIAS)

R 6

27,848

Young, L.R. & Stark, L. BIOLOGICAL CONTROL SYSTEMS - A CRITICAL REVIEW AND EVALUATION, DEVELOPMENTS IN MANUAL CONTROL. Contract NAS 2 1372, NASA CR 190, March 1965, 221pp. National Aeronautics & Space Administration, Washington, D.C. (Biosystems, Incorporated, Cambridge, Mass.).

As part of a critical review of the entire field of biological control systems, this report deals with recent developments in the area of manual control. It is concerned with systems analysis models for manual control, and the attempts to more fully explain the biological operation through servoanalysis and computer simulation. The report does not deal with the "human engineering" aspects of manual control, such as display-control compatibility or system equalization. The emphasis is on recent (post 1957) development of more sophisticated mathematical models to describe and perhaps explain some of the "fine structure" in control of manual responses. These models fall primarily into the basic research category rather than as guidelines for man-machine integration. A number of models dealing with discrete aspects of human response are reviewed and evaluated.

R 87

27,849

Kasten, D.F. INTERDISCIPLINARY MEASUREMENT OF HUMAN PERFORMANCE UNDER LOW AND ZERO GRAVITY CONDITIONS. ca. 1965, 13pp. USAF 6570th Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (AD 620931)

The evolution of a methodology in zero gravity research is briefly presented. It was found that generally a 4 part program develops for each major research area. This research incorporates the following stages: a) Problem definition; b) Physical analysis; c) Experimental validation; d) Space projection. Throughout the history of our reduced gravity program, research personnel representing different disciplines have worked together in solving new and unusual problems. In 1958 there was no formal program for investigating the effects of weightlessness. Now, 6 years later, we have regular indoctrination flights, research under zero-G, Lunar G, even Mars G, pressure suited Ss practicing programmed space tasks and seeking the best methods for performing those tasks. We have research on human physiology, human performance, man-machine relationships, and throughout we have the cooperation of psychologists and anthropologists, physiologists, engineers and pilots.

R 14

27,850

Lester, J.T., Jr. ACQUAINTANCE AND COMPATIBILITY. BEHAVIORAL RESEARCH DURING THE 1963 AMERICAN MOUNT EVEREST EXPEDITION. Contract Nonr 4672(00), Proj. NR 171 257, Tech. Rep. 2, Aug. 1965, 36pp. USN Group Psychology Branch, ONR, Washington, D.C. (Berkeley Institute of Psychological Research, San Francisco, Calif.). (AD 619531)

The present report summarizes a second aspect of the behavioral research done on the 1963 American Mt. Everest Expedition, viz., a testing of hypotheses proposed by Theodore Newcomb concerning the processes through which emerge a set of stable relationships among a group of initial strangers. It also reports the results of relating predicted compatibility (predictions based on test results from the Fundamental Interpersonal Relations Orientation Inventory) to self-rated compatibility. On the whole the Newcomb hypotheses were supported. Results regarding compatibility were negative.

R 7

27,851

Jensen, J.J. GETTING STARTED AT SUPERVISORY TRAINING. Rep. P 3227, Sept. 1965, 8pp. Rand Corporation, Santa Monica, Calif. (AD 620954)

Getting started at supervisory training that will be successful is not easy, but it is less difficult for the training director who acts on the following considerations: a) Careful strategy in introducing and running a supervisory training program is every bit as important as its content; b) The supervisory group should be actively involved in the early stages of program planning; c) All training material should be carefully pretested to assure acceptance by trainees; d) Attendance at training sessions should be voluntary; e) A training program should grow and develop on the basis of success. Modest beginnings are best; f) Top and middle management should be maintained through regular reports emphasizing the relationship between training, problemsolving and profitmaking.

27,852

Levenbach, G.J. SYSTEMS RELIABILITY AND ENGINEERING STATISTICAL ASPECTS. Amer. Scientist, Sept. 1965, 53(3), 375-384.

The author presents a brief history of the development of the concern with the reliability of a system. He then reviews early statistical formulations of reliability and concluded that there is more to reliability than putting numbers into a statistical model and writing numerical reliability requirements into a specification. Several examples are offered to illustrate the point that reliability is an engineering function. After a general explanation of the reliability concept the article concluded with a discussion of the general flow of events from inception to completion of a system as seen from the reliability viewpoint.

R 7

27,853

Block, H.D. LEARNING IN SOME SIMPLE NON-BIOLOGICAL SYSTEMS. Amer. Scientist, March 1965, 53(1), 59-79.

Some simple machines are discussed which "learn" or adapt themselves so as to optimize their performance in some fairly intellectual games. The "learning" is caused by a simple automatic mechanism which operates inside the machine as a consequence of the machine's being informed whether it has won or lost the game. If these learning curves represented the performance of some animal, they might well suggest some "vitalistic factor." Although we do not know the actual physical changes which cause biological learning, we have nevertheless shown how a simple mechanism might account for a complex learning curve. The question is invariably raised as to whether, on the basis of such "learning curves," we can claim that the machine is "thinking" or possesses "intelligence."

R 39

27,854

Sherwood, R.J. & Greenhalgh, D.M.S. A SELF CONTAINED PRESSURIZED BLOUSE. Ann. occup. Hygiene, July 1965, 8(3), 247-252. (Health Physics & Medical Div., Harwell, England).

A device has been developed to provide personal protection against radioactive and other toxic substances; we believe it offers the same mobility and convenience as filter respirators but ensures more dependable protection and greater comfort. It comprises a plastic blouse with transparent headpiece which is pressurized by filtered air drawn from the environment by means of the self-contained battery-operated blower. Working times up to 1 hr can readily be obtained from dry batteries, and up to 2 1/2 hr from rechargeable nickel-cadmium batteries.

R 9

27,855

Glick, J.A., Wapner, S. & Werner, H. SOME RELATIONS BETWEEN AUTOKINETIC MOTION AND SPACE LOCALIZATION. Acta psychol., Amsterdam, May 1965, 24(1), 41-48. (Clark University, Worcester, Mass.).

The relationship between autokinetic motion and apparent object displacement was assessed by comparing the results of 2 experiments: in each experiment, a horizontal luminous line served as stimulus object, and both ascending and descending gliding tones were employed; in one experiment, autokinetic motion was measured and in the other, spatial displacement in the up-down dimension was measured. Whereas dynamic auditory stimulation leads to apparent motion of the stimulus object relatively in the direction of tonal dynamics, it also leads to an apparent displacement of the stimulus object in a direction relatively opposite tonal dynamics. Further, independent of auditory stimulation conditions, the overall direction of autokinetic motion was upward and the overall direction of apparent displacement of the stimulus object was also upward. The problem posed by these paradoxical findings for an understanding of perceptual processes is discussed.

R 8

27,856

Madan, V. & Dey, M.K. RELATION OF THE EFFECT OF KNOWLEDGE OF RESULTS TO DISTRIBUTION OF TRIALS. Acta psychol., Amsterdam, May 1965, 24(1), 68-80. (Panjab University, Chandigarh, India).

The hypothesis was advanced that the effect of any variable on performance improvement by knowledge of results (KR) depends upon how it separately influences the informative and motivational functions of KR. It was predicted from this hypothesis that the rate of performance improvement by KR would be higher with massed rather than distributed trials if KR were so administered as to minimize its informative function. An Exp. carried out with a simple time-estimating skill to verify the above deduction has furnished inconclusive evidence. Other results of this Exp. are: a) support for the conclusion reached by certain previous investigators that the rate of performance improvement is directly proportional to the percentage of trials with KR; and b) failure to obtain significant performance decrement following the cessation of KR.

R 20

27,857

Vielhaber, D.P. & Lauterbach, C.G. PRETRAINING CORRELATES OF TRAINFIRE MARKSMANSHIP. Tech. Rep. 17, Jan. 1965, 12pp. USA Hospital, West Point, N.Y. (AD 622293)

Entering USMA cadets of the Class of 1967 were studied to determine whether prior weapons experience, intelligence, or their parents' or their own attitudes toward weapons influenced their subsequent rifle firing scores in a "Trainfire" marksmanship course. A cadet's expressed confidence in his firing ability was found to be a limited, yet the best, single predictor of his range firing scores. Although items concerning prior firing experience, and items concerning cadet and parental attitudes toward weapons, were also correlated with the criteria of range firing scores, they did not add substantially to the predictive ability of the confidence item. The correlations of experience with range scores were lower than in previously reported studies. Intelligence, which was correlated with marksmanship scores of Army basic trainees, was not found to be an effective predictor in this cadet population.

R 6

27,858

Brodsky, N. (Chm.). LOGISTICS RESEARCH CONFERENCE. VOLUME II - 7. May 1965, 168pp. Airline Conference Center, Warrenton, Va. (AD 623231)

The following papers are included: Cost/effectiveness analysis within the Army, cost effectiveness projects in the Navy department, recent mathematical modeling/cost effectiveness projects in the Air Force, military essentiality, cost effectiveness for integrated logistics support systems and equipment, summary and recent work in measuring the productivity of federal agencies, chance-constrained programming and related approaches to cost effectiveness, and 3 levels of cost/effectiveness associated with personnel attitudes and attributes.

R many

27,859

Waters, L.K. A STUDY OF STATEMENT ATTRACTIVENESS INDICES OBTAINED UNDER PERSONAL AND SOCIAL ORIENTATIONS. BuMed. Proj. MF022.01.02 5001, Subtask 1, NSAM 937, Rep. 44, July 1965, 5pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (AD 622285)

Index deviation values for 2 indices of statement attractiveness, stressing either the personal or social acceptability of the statements, were correlated with each other, with 4 other attractiveness indices obtained previously, and with frequencies of statement choice obtained under 4 response sets. The correlation between the 2 indices and their relationship to previously obtained attractiveness indices and choice frequencies indicated the personal and socially oriented indices represented essentially the same attractiveness dimension for the cadet groups. The dimension appeared to be one of general desirability as contrasted to specific job (training program) desirability.

R 4

27,860

Mikk, A. HUMAN ENGINEERING EVALUATION OF LOW FREQUENCY BEACON SYSTEMS. USATECOM Proj. 4 5 3080 03, Letter Rep. 10, July 1965, 44pp. USA Human Engineering Labs., Systems Research Lab., Aberdeen Proving Ground, Md. (AD 469557)

All of the beacon systems evaluated require excessive time for setup and disassembly. The time required to disassemble the beacon systems is a great deal dependent on the number of guy lines and radials to be rewound. The TRIDEA 111900 beacon system was judged to be superior to the other systems due to its light weight, simplicity of setup procedures and ease of operation. All of the beacon systems are capable of being assembled by 1 man. The task would, however, be a difficult one to accomplish under a high wind condition. The AN/PRT-7 Beacon Control Panel requires redesign to meet the minimum human engineering requirements. The antenna type used is not as readily assembled as the other antennas evaluated. The operator has to position all parts within arm reach so as to be able to reach them during the vertical antenna assembly phase. The deficiencies and shortcomings would prevent the proper operation of equipment and should be corrected.

R 6



27,861

Hewitt, E.J. ALL-PURPOSE MATRIX FOR MOLDED FOOD BARS. FINAL REPORT, 17 SEPTEMBER 1962-2 NOVEMBER, 1964. Contract DA19 129 AMC 2111, Proj. 1K643303D548, Tech. Rep. FD 14, Aug. 1965, 70pp. USA Natick Labs., Natick, Mass. (Evans Research & Development Corporation, New York, N.Y.).

The object of the program was to produce a suitable matrix for various food components (soups, beverages and casseroles) which would not detract from the basic flavor of the major food components. A satisfactory matrix was made from lactose (99%) and sodium carboxymethylcellulose (1%). The matrix can be produced successfully by tray-drying or freeze-drying. This report summarizes the work performed in Phase I & Phase II of the contract and gives the results of the various shelf-life tests. In general, the lactose/carboxymethylcellulose matrix performed well over the broad range of products that were tested.

27,862

Conley, D.W. POST-CRASH FIRE-FIGHTING STUDIES ON TRANSPORT CATEGORY AIRCRAFT. FINAL REPORT. Proj. 430 002 OIX, Rep. RD 65 50, May 1965, 31pp. US Systems Research & Development Service, FAA, Atlantic City, N.J. (AD 621676)

Information was obtained on the effectiveness of helicopter downwash and ground foam equipment in extending the escape time for aircraft occupants in a post-crash fire environment by burning 5 C-97 aircraft under similar conditions. Additional tests, not involving C-97 aircraft, were conducted relative to rescue path studies. Test data indicated that helicopter downwash extended the escape time when fire existed solely on the upwind side of a C-97 fuselage, but reduced the escape time when fire was on both sides or solely on the downwind side of the fuselage. It was also found that helicopter downwash provided a considerable reduction in the radiant heat and air temperature in a simulated rescue path. For the standard fire condition used and the equipment employed, the ability of ground crews to extend the escape time was found to be dependent upon the preburn time and the fuselage integrity with respect to emergency doors open or closed. An escape time of 50 sec was computed for a C-97 with emergency doors open as compared to 138 sec for a C-97 with emergency doors closed. Test results amplify the need for a quick arrival of extinguishing equipment and a capability for a quick "knockdown" and control of the fire.

R 7

27,863

Harris, J.L., Sr. MECHANISMS OF SPATIAL SUMMATION. Contract NObs 86012, Lot 1, Rep. 2, May 1965, 22pp. S.O. Duntley, LaJolla, Calif. (AD 619951)

In this study a simple model was postulated, analyzed, and compared in terms of performance with data from a vision experiment. The purpose of the study was not to attempt to validate the model, but rather to determine whether it is possible to find models in which the extent of spatial summation exhibited by the visual system can be achieved using only the point spread function associated with retinal imagery and probability summation. The results of the study indicate that the simple model does result in the proper degree of spatial summation using only the point spread function and probability summation mechanisms. The quantum efficiency calculation does not prove the validity of the model but does show that the model is compatible with quantum statistics, i.e., it is statistically possible for the model to yield the performance indicated by vision experiment with the assumption of a reasonable value of quantum efficiency for each receptor. From the study it may be concluded that the results achieved by analysis of this simple model are sufficiently promising to warrant further study with models which are refined to include additional known properties of the human visual system.

27,864

Halle, Marjorie B. & Ashby, W.L. FORECASTS OF FLIGHT ACTIVITY CONUS, 1965-1980. Proj. 141 411 OIA, Rep. RD 65 68, July 1965, 21pp. US Systems Research & Development Service, FAA, Washington, D.C. (AD 620020)

The purpose of this report is to provide a convenient reference document for the use of SRDS and other FAA personnel who have a need for estimates of future air traffic activity. Civil fleet size estimates for the 48 conterminous United States (CONUS) for 1965, 1970 and 1975 were derived from forecasts in 2 Office of Policy Development reports. Military fleet size and flying hour estimates through 1975 were furnished by the military services. The 1980 projections are trend extrapolations. Projections of active aircraft fleet size during the 1965-80 period have been translated into measures of airspace utilization--flying hours, flights, operations and distances flown. Those measures are categorized by user class, type aircraft, flight rule and type of flight. In addition, selected activity characteristics have been derived--annual aircraft utilization, flying hours per flight, flight distances and aircraft speeds. Details of the methods of calculation are given in a report titled "Handbook of Air Traffic Projections, CONUS, 1962-1980", Traffic and Economic Analysis Branch, ATC Development Division, April 1964. Selected measures of air traffic activity are summarized in tabular and graphic form. Detailed estimates for 1965, 1970, 1975 and 1980 are contained in tables.

27,865

Rosenberg, R.C. COMPUTER-AIDED TEACHING OF DYNAMIC SYSTEM BEHAVIOR. Contract AF 19(628) 3317, Proj. 7682, Task 768204, ESD TR 66 260, DSR 9960 5, Nov. 1965, 110pp. USAF Decision Sciences Lab., L.G. Hanscom Field, Bedford, Mass. (Engineering Projects Lab., Massachusetts Institute of Technology, Cambridge, Mass.).

A Dynamic Systems Laboratory based on a time-shared digital computer is described. The laboratory simulates the time domain behavior of linear, lumped-parameter passive and active dynamic systems. The response variables, (included powers and energies), are available in tabular and graph form, and rapid access data are generated and displayed by an analog computer under digital control. Problems are specified in a circuit-like notation called bond graphs. The Dynamic Systems Laboratory was used as the basis of an open-loop teaching system. An experiment is discussed in which 4 Ss were provided with a guidebook and access to the laboratory. Generalizations about the behavior of linear first-and-second-order systems were developed by the Ss, based largely on experimentally obtained data. One mode of operation, that of testing and identifying unknown systems, achieved considerable success. This mode of application was useful for testing Ss' understanding, and motivation, and for developing a basis for teaching strategies of synthesis.

R 39

27,866

Ryzl, M. MODEL OF PARAPSYCHOLOGICAL COMMUNICATION. FTD TT 65 366/1-4, July 1965, 22pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Sdelovaci Technika (Czechoslovakian), 1964, 8, 299-302). (AD 466927)

The conducted experiment offers us basically proof about the practical applicability of MSV (mental telepathy) as a means of communication. Its practical application can be expected mainly in long distance communication, and this is especially under conditions, when normal radio communication is impossible. Such practical utilization will require further investigation for determination of definite reliability measures over long distance as was attained at short ranges. The experiment has certain special traits: use of repetition determination methods, use of 2 parallel series of experimental determinations which were mutually verified and supplemented. Introduction of more exact methods for evaluation of the experimental data and the fixing of experimental conditions fitting the theory of probability and the theory of information may without doubt lead to an increase in economy in transferring information achieved in this way.

R 18

27,867

Ross, J.J. NEUROLOGICAL FINDINGS AFTER PROLONGED SLEEP DEPRIVATION. Arch. Neurol., April 1965, 12, 399-403. (USN Hospital, San Diego, Calif.). (Reprint) (AD 621083)

A case of a 17-year-old male who was sleep-deprived for 264 hrs. is described, and the previously reported cases of prolonged wakefulness (greater than 120 hrs.) are briefly reviewed. Psychiatrically the patient experienced the visual misperceptions, temporal disorientation, cognitive disorganization, and tactual misperceptions that others had experienced, but at the end of the vigil he was psychiatrically much healthier. During the vigil he showed difficulty with focusing his eyes, stereognosis, equilibrium, and speaking. Multiple neurological examinations demonstrated that aside from quite evident physical and mental fatigue, the patient showed no significant abnormalities.

R 29

27,868

Kasper, A.S. CORRELATION OF INSTRUMENTATION WITH PAINTED APPEARANCE. Rep. 650065, ca. 1965, 22-28. Society of Automotive Engineers, Inc., New York, N.Y. (Chrysler Corporation, Detroit, Mich.). (Reprint)

Definite relationships have been established between the visual appearance of painted surfaces and the surface texture of the underlying sheet metal. The sensitivity of this effect is shown to be quantitatively dependent upon the paint thickness and type of finishing system. It has been further established, for the first time, that a combination of microinch roughness height and peak count readings of surface texture correlate better with final painted appearance of sheet metal panels than does microinch roughness height reading alone. Instrumented measurements of surface texture were also shown to be significantly more meaningful than visual evaluations of bare metal surfaces in correlating with final painted appearance.

27,869

Hanaway, J.F., Carley, R.R. & Vernon, J.A. GEMINI FLIGHT CONTROL SYSTEM PERFORMANCE DURING THE SECOND UNMANNED FLIGHT. Rep. 650595, ca. 1965, 308-315. Society of Automotive Engineers, Inc., New York, N.Y. (Manned Spacecraft Center, NASA, Houston, Tex.). (Reprint)

The second Gemini flight provided the first opportunity to evaluate the spacecraft flight system performance in its actual operational environment. The post-flight evaluation proved the adequacy of the system and removed one of the constraints on the subsequent manned flights. This paper presents and discusses the results of that evaluation. The flight control system is briefly described as are the special measures taken to permit operation in an unmanned configuration. The maneuvers required of the system during the mission are described as are the data and analysis procedures utilized. Finally, system performance during each maneuver or stage of the flight is examined and compared with that predicted in pre-flight studies and simulations.

27,870

Eliason, D.W. & Utter, D.H. A PILOT DISPLAY CONCEPT FOR NEAR-TARGET MANEUVERS DURING RENDEZVOUS. Rep. 6 65 65 3, March 1965, 25pp. Missiles & Space Company, Lockheed Aircraft Corp., Sunnyvale, Calif. (AD 613958)

A preliminary investigation was carried out for a translational control system concept for near-target maneuvers during rendezvous. The maneuvers are applicable to such missions as docking, inspection, and the Air Force Remote Maneuvering Unit. The concept consists of: a) a small constant thrust acceleration directed at the target by the maneuvering vehicle; b) a phase-plane CRT representation of radar range and range rate with superimposed overlay contours; and c) a means for determining the appropriate scale factors for the phase-plane display in the general case. Translation is effected by suitable combinations of thrusting and non-thrusting periods. A pilot task description is given for a typical range change maneuver.

R 3

27,871

Engelbart, D.C. & Sorensen, P.H. EXPLORATIONS IN THE AUTOMATION OF SENSORIMOTOR SKILL TRAINING. FINAL REPORT, Contract N61339 1517, Proj. 7820, Tech. Re. NAVTRADEVEN 1517 1, May 1965, 75pp. USN Training Device Center, Port Washington, N.Y. (Stanford Research Institute, Menlo Park, Calif.). (AD 619046)

Some problems of automating sensorimotor skill training were explored with a system served by a CDC 106-A computer. Ss were trained to transmit 31 alphanumeric characters on 5-key chord keysets. Training conditions varied response prompting (cueing) and confirmation (feedback). Prompting stimuli were a) lights (automated visual), b) air jets (automated tactile), c) reference sheets (nonautomated). Some Ss received feedback; others received none. Discriminability of automated prompts were also compared. Throughout experimentation, the computer controlled all presentations and recorded individual performance. No reliable group differences were found in terminal speed or accuracy among groups trained under different prompting conditions. The group trained with tactile prompts was least variable in response speed but most variable in response accuracy. Feedback signals aided code learning regardless of prompting. Discrimination tests favored visual over tactile prompts; tactile stimuli were difficult for most Ss to discriminate.

R 15

27,872

USA Aviation Test Activity. LETTER REPORT OF PRELIMINARY PILOT QUALITATIVE EVALUATION OF THE XV-5A RESEARCH AIRCRAFT. Oct. 1965, 48pp. USA Aviation Test Activity, Edwards AFB, Calif. (AD 623514)

The tests comprising this evaluation examined those aircraft characteristics which are directly influenced by the Lift-Fan concept; this report contains the results obtained during the stability and control portion of the program. 5 deficiencies which require corrective action were observed: unsatisfactory in-flight cockpit temperature control vent system, inadequate braking system leading to brake overheating and failures, aircraft disturbances in 0- to 10-foot wheel height area impairing pilot's ability to perform precise tasks, overtemp conditions of engine causing some performance limitation, airframe structural heating characteristics causing fan-powered flight limitation. Also a number of desirable modifications were indicated; these included cockpit instrument and switch locations, cockpit visibility in downward and aft directions, canopy release mechanism indications, other engine overtemp characteristics, and lift-fan air re-ingestion and overspeed characteristics. (HEIA) R 4

27,873

Wainwright, G.E. CONFIGURAL INFORMATION IN ITEM RESPONSES. Contract Nonr 477(33), Public Health Grant MH00743 08, Sept. 1965, 202pp. University of Washington, Seattle, Wash. (AD 471560)

This report develops a rationale for investigating systematically the amount of configural or nonlinear information in a matrix of binary item responses. Both multiple regression and eigenvalue type models are utilized in the research. Computational procedures are also developed and appropriate Fortran computer programs are presented. The technology is applied to substantive data. The contention of many clinical psychologists that it can be important to consider the configuration of a client's responses is verified. R 16

27,874

Wolkovitch, J. & Walton, R.P. VTOL AND HELICOPTER APPROXIMATE TRANSFER FUNCTIONS AND CLOSED-LOOP HANDLING QUALITIES. FINAL REPORT. STI Tech. Rep. 128 1, June 1965, 277pp. USN Bureau of Naval Weapons, Washington, D.C. (Systems Technology, Inc., Hawthorne, Calif.). (AD 470137)

Formulas expressing transfer function numerator and denominator approximate factors in terms of derivatives are obtained for tilt-wing and tilt-duct VTOL configurations and single- and tandem-rotor helicopters. Longitudinal and lateral transfer functions are considered for all except the tilt-wing configuration, for which no adequate lateral derivative data were available. The accuracy of the formulas is checked for one example of each configuration at several speeds in the range 0 to 120 ft/sec, and extensive comparisons of exact and approximate factors are tabulated. Hovering dynamics are described, and a full description is given of the process by which, as forward speed is increased, the conventional modes emerge. The implications of representative VTOL and helicopter transfer functions for closed-loop control are studied, with special emphasis on human rather than automatic pilots. Handling qualities theory is used to predict difficult control situations and to make suggestions for their improvement. The available experimental data on VTOL and helicopter closed-loop handling qualities are reviewed and compared with theoretical predictions and published empirical criteria. Because of the great variety of transfer functions, it seems doubtful whether generally applicable simple criteria for good handling qualities can be produced, except at hover. R 64

27,875

Willis, D.G. STRATEGIES OF FUNCTION DECOMPOSITION FOR ARTIFICIAL INTELLIGENCE. VOLUME 11. SEPTEMBER 1964-JUNE 1965. Contracts AF 49(638) 1315 & AF 49(638) 1454, Proj. 9769, Task 976906, AFOSR 65 1612, Res. Notes 12-25, July 1965, 138pp. USAF Information Research Div., OSR, Washington, D.C. (Computer Usage Company, Inc., Palo Alto, Calif.). (AD 620186)

Preliminary results are reported in 13 research notes on strategies of function decomposition solely from observations of inputs (variable configurations) and outputs (function values). The classes of functions to which the results apply include discrete, finite, deterministic functions as well as arbitrary close discrete approximations to continuous functions of continuous variables. Non-deterministic (i.e., probabilistic) and sequential (i.e., finite automata) functions are not included. The research notes consider: a) decomposition costs and the equivalence of all measures of cost or complexity; b) the detection of economical decompositions; and c) generalizing properties of economical decompositions. Efficient procedures are suggested for detecting economical non-composite decompositions of any given partial or total discrete function solely from input and output observations. Composite decompositions become tractable when enough is known or properly conjectured about their sub-functions. R 5

27,876

Flake, A.R. SELECTION AND TRAINING OF COMMANDERS. Air Univ. Rev., Nov.-Dec. 1965, 17(1), 10-22. (USAF Air War College, Maxwell AFB, Ala.).

This article has presented an organized approach to the problem of selecting, training, and developing leadership. If accepted, scientific selection and organized development systems will replace the current practice of personal selection and haphazard development. The direct result would be increased effectiveness in the management of Air Force units. Personal selection, along with such practices as automatic succession and selection by reference to effectiveness reports alone, is inefficient and cannot be expected to provide effective leadership in a modern military force. With these and all other factors considered, a definite timetable of selection actions should be established. To hasten the availability of qualified candidates for command assignment, the program should perhaps initially be open to a wider age group than would be desirable permanently. R 36

27,877

Kaapke, L.D. & Alvord, R.W. A NEW ASSESSMENT OF COMMANDER EFFECTIVENESS? Air Univ. Rev., Nov.-Dec. 1965, 17(1), 23-27. (USAF 6570th Personnel Research Lab., Lackland AFB, Tex.).

The key to retention, from both a qualitative and quantitative point of view, lies in the ability of the Air Force and every career officer in the Air Force to convince junior officers that the job incentives and rewards they want can be found in the Air Force. The objective, then, must be for every officer to develop the occupational environment which makes these incentives a minimum goal. We can anticipate little outside assistance in achieving this purpose. It does seem to be within the capacity of the Air Force, however, to provide for and to emphasize promotion on the basis of ability, work of which one's family can be proud, and similar aspects of its officers' occupation. Finally, the Air Force through its commanders must work to devise and improve a personnel planning system which will provide greater opportunity on the basis of ability and personnel policies which will be viewed as consistent and intelligent by the officer force. Participation without subsequent action must not result; in other words, action to improve personnel planning, not publicity or indoctrination, is needed. The final result of the effort described--to provide an occupational environment conducive to choosing the Air Force as a career--will be a selective, strong, responsive, and future-oriented Air Force.

R 5

27,878

Mock, J.E. & Hobbs, W.E., Jr. MATHEMATICS AND STRATEGY. Air Univ. Rev., Nov.-Dec. 1965, 17(1), 52-60. (USAF Academy, Colo.).

Mathematics, strategy, and game theory are all being brought together to help provide the military commander with a logical and rational approach to making complex decisions. The need for great strategists such as Alexander the Great, Hannibal, Caesar, Napoleon, and MacArthur will never be eliminated, but new techniques such as these will enable a larger percentage of capable commanders to make better decisions, be it in peace or in war.

R 7

27,879

Kryter, K.D. DAMAGE RISK CRITERION AND CONTOURS BASED ON PERMANENT AND TEMPORARY HEARING LOSS DATA. Amer. industr. hyq. Assoc. J., Jan.-Feb. 1965, 26(1), 34-44. (Bolt Beranek & Newman, Inc., Cambridge, Mass.).

A damage risk criterion is proposed that provides more protection for the frequency region of hearing important to speech perception than to other areas. Damage risk contours are drawn to this criterion on the basis of rather detailed temporary threshold shift data obtained in the laboratory. The TTS<sub>2</sub> found in young adults with normal hearing, from an 8-hour exposure to a noise has about the same numerical magnitude as the KIPTS in industrial workers exposed for 10 or more years, 8 hours per workday, to about the same noise; it is concluded that TTS data can be used as a reasonably valid secondary yardstick for assessing the potential damage risk for permanent threshold shifts due to exposure to noise. The damage risk contours proposed represent a degree of calculated risk for persons exposed to the levels, spectra, and daily durations specified. This risk can best be met by lowering the levels specified by 10 db or so; if this is not practical, a program for monitoring the hearing of noise-exposed workers could be used in order to detect, and remove from the noise, those workers showing significant permanent threshold shifts.

R 19

27,880

Skillern, C.P. HUMAN RESPONSE TO MEASURED SOUND PRESSURE LEVELS FROM ULTRASONIC DEVICES. Amer. industr. hyq. Assoc. J., March-April 1965, 26(2), 132-136. (General Electric Company, Richland, Wash.).

Measurements of noise levels were made in the vicinity of ultrasonic devices used for cleaning, welding and drilling. These devices had operating fs from 15,000 to 80,000 cps. At levels of 80-90 db subjective intolerance was manifest; above 90 db ill effects and pain began. There was indication of narrow band sensitivity at 22,400-28,000 cps. The greater annoyance from ultrasonic drills was also related to the longer periods of actual operation. This study using in-plant noise levels isn't meant to imply that the levels measured are absolute guides. It would be undesirable to use these levels for anything but temporary guides, as sufficient measurements both clinical and environmental are still unavailable. It does point out, however, the desirability of more study and the need for experimental data.

R 2

27,881

Schneider, M. & Tobey, S. THE MAINTENANCE OF A LIFE SUPPORT ATMOSPHERE IN SEALED SYSTEMS. Amer. industr. hyq. Assoc. J., March-April 1965, 26(2), 177-186. (Research & Development Div., North American Aviation, Inc., Los Angeles, Calif.).

2 feasibility studies described here explored the conditions necessary for a life support system suitable for a manned space vehicle. White rats were placed in a closed system with a recirculating air loop. Solid potassium superoxide was used as a combination oxygen generator and carbon dioxide absorber, and potassium hydroxide was used as a supplemental carbon dioxide absorber. At the conclusion of the 25-day test period the rats remained alive and healthy. A thorough chemical analysis was performed to determine the average animal respiratory quotient and chemical system efficiencies. 2 human Ss were maintained for 14 days in a sealed-environment life support system with dual air regeneration loops. The air regeneration system was evaluated at various oxygen and carbon dioxide partial pressures and relative humidities. At the conclusion of the test period, the Ss were examined and judged healthy.

R 9

27,882

Zenz, C. & Berg, B.A. ANOTHER TOOL FOR HEARING CONSERVATION. AN IMPROVED PROTECTOR. Amer. industr. hyq. Assoc. J., March-April 1965, 26(2), 187-188. (Allis-Chalmers Manufacturing Company, Milwaukee, Wisc.).

A variety of hearing protectors are available, most offering adequate attenuation against harmful noise. Despite a wide selection, employees frequently wear dry cotton in lieu of suitable devices provided. A Swedish material proved effective in Europe, composed of glass fibers with a diameter of 0.001 to 0.002 mm, was obtained for trial use. Excellent employee acceptance beyond expectation followed. Annual cost is estimated about \$4 per man per year.

27,883

Brown, H.V. THE HISTORY OF INDUSTRIAL HYGIENE: A REVIEW WITH SPECIAL REFERENCE TO SILICOSIS. Amer. industr. hyq. Assoc. J., May-June 1965, 26(3), 212-226. (Environmental Health & Safety Office, University of California, Los Angeles, Calif.).

The historical development of industrial hygiene is presented with silicosis as the unifying theme. The development of protective, evaluative, and control measures is followed. Because of lack of reporting uniformity, the true magnitude of the silicosis problem is not known today, but it is still a major industrial hygiene problem. It will continue as a major, though solvable, problem so long as man continues to mine, cast metal, operate quarries, and use natural mineral products, for silicon dioxide is one of the most abundant materials making up the crust of the earth. The publicity given the "new" hazards, such as ionizing radiation and air pollution, has captured the attention of many of the "safety-minded" people of our society, but the ancient and prosaic occupational diseases, such as plumbism, mercurialism, and silicosis, are still important. The industrial hygienist, as he has in the past, can solve many of the problems involved in making our modern civilization a safe and healthful one.

R 100

27,884

Goldman, L. & Hornby, P. PERSONNEL PROTECTION FROM HIGH-ENERGY LASERS. Amer. industr. hyq. Assoc. J., Nov.-Dec. 1965, 26(6), 553-557. (Children's Hospital Research Foundation, Cincinnati, Ohio & University of Cincinnati Medical Center, Cincinnati, Ohio).

The facets of the protection scheme for high-energy lasers of 50 joules or more exit energy include the design of the laboratory and the instruments to minimize the hazards of laser radiation therapy in terms of reflectance from the target area. The most important phase of protection continues to be eye protection by means of heavy welder's goggles with effective filters. Chronic skin exposure should be avoided through the use of drapes and protective black felt coverings. It is emphasized that as yet for laser radiation little is known of the late changes at the cellular level.

R 8

27,885

Zenz, C. & Berg, B.A. ASSESSMENT OF PHYSIOLOGICAL STRESS DURING CLIMBING. Amer. industr. hyq. Assoc. J., Nov.-Dec. 1965, 26(6), 574-578. (Allis-Chalmers Manufacturing Company, Milwaukee, Wisc.).

Measurement of certain physiological variables during work are readily obtainable and are known to be significant for determination of energy expenditure. This investigation was a working test conducted in the plant, using suitably erected scaffolding for a vertical climb of 20 ft. 18 healthy workers (age range 27 to 65) were tested. A cardiometer, a portable respirometer, and a polarographic oxygen sensor were used to make continuous recordings of the heart rates, ventilatory volume, and oxygen consumption before, during, and after climbing. The energy expenditure for the described task ranged from 5 to 11 kcal/min, with an average of 8.4 kcal/min. In terms of caloric energy expenditure and because of rapid return to normal pulse rates, this climbing situation presents only a moderate physical stress.

R 14

27,886

Kreithen, A. VOCABULARY CONTROL IN AUTOMATIC INDEXING. Data Processing, Feb. 1965, 7(2), 60-61. (Documentation Incorporated, Washington, D.C.).

This article discusses the major problem in automatic indexing--that of controlling the quantity and quality (relevance) of indexing terms which represent the contents of a document. A combination of the 2 automatic indexing methods--assignment and extraction--is considered a desirable solution. By this technique a number of indexing terms would be assigned to the document on the basis of its category dependency, and the rest extracted from the text. Vocabulary editing procedures to reduce vocabulary redundancy are also indicated. (HEIAS)

27,887

Booth, R.E., Monroe, Jean, Peterson, D. & Song, C. THE USES OF TECHNOLOGY AND INFORMATION TRANSFER. Data Processing, June 1965, 7(6), 30-33. (Wayne State University, Detroit, Mich.).

The work of Wayne State University's Center for the Application of Sciences and Technology (established in 1963) is described. Its program of technology utilization and information transfer is viewed in systems engineering terms and is discussed under the following basic concepts: data inputs (storage subsystem), data inputs (manual retrieval subsystem), data inputs (computer based retrieval subsystem), user request inputs (retrieval subsystem), and output. (HEIAS)

27,888

Rudie, D.D., Youchah, M.I. & Johnson, E.J. DATA PROCESSING SYSTEMS SIMULATOR. Data Processing, June 1965, 7(6), 64-66. (Systems Development Corporation, Santa Monica, Calif.).

In this article the Data Processing system simulator--its development, uses, and advantages--are briefly described. It is a flexible general purpose computer program that can be used to provide performance data for both large and small scale information processing systems. This information can be used for evaluating a proposed new design, a modification of an existing design, and in later phases for assessing and providing guidance in the development of a data processing system. (HEIAS)

27,889

Magnis, N.E. TIME SHARING. Data Processing, July 1965, 7(7), 26-29.

This article discusses the concept of time sharing by differentiating it into meaningful elements, real time (the fundamental precept); user software (use, availability, creation of programs; capability and location of remote consoles); basis for access to computer (commutation or queueing); and availability of data in time shared files (active or dormant, restricted or unrestricted files). Several kinds of time sharing applications are briefly reviewed, e.g., airlines reservation systems and on-time savings accounting. (HEIAS)

27,890

Campbell, S.G. TIME SHARING--SOME PROBLEMS, POTENTIALITIES AND IMPLICATIONS. Data Processing, Sept. 1965, 7(9), 30-33. (Xerox Corporation, Rochester, N.Y.).

Time sharing is first defined in terms of its most essential objectives: a) the facility for more than one individual to use the same central processor, memory, files, and programming system during the same interval of time, with minimal interference; b) availability of the full power of the central computing system without apparent restriction caused by the existence of other users; c) system response characteristics for each individual user on a time scale commensurate with that required for the human decision-making processes involved; d) replacement of requirement that the user must be located in close proximity to the central system with the requirement that he be located near a suitable communication link; e) provision of a man/machine information transducer which interfaces efficiently between human user and communications link (e.g., switched telephone line with dataphone), allowing full use of the computer facility and allowing for unsymmetric information input/output characteristics of the human. The psychological aspects of these objectives are pointed up and the success of time sharing discussed relative to acceptance of the computer in decision-making functions. The importance of allowing regionalism in computer languages and the economics of time sharing are also considered.

27,891

Rothery, B. THE MOVEMENT OF INFORMATION. Data Processing, Nov. 1965, 7(11), 54-55.

This brief article describes the various levels at which useful information moves from the newspapers (immediate vehicles) to the general interest magazine to specialized magazines and finally to the textbook. The characteristics of superficiality and flexibility, most prominent at the newspaper level, are seen as compensating. The immense problems of classifying and retrieving information for the specialist are noted. (HEIAS)

27,892

Kienholz, D.F., Walker, B.H. & MacRobbie, W. WIDE ANGLE OPTICAL PROJECTION SYSTEM (U). FINAL RESEARCH REPORT. PART I. Contract Nonr 4514(00), Rep. LMEJ 7426, April 1965, 82pp. Light Military Electronics Dept., General Electric Company, Johnson City, N.Y. (AD 472205)

An optical design study was undertaken with the objective of conceiving and proving feasibility of an optical system which would provide a 25° binocular field of view for a typical head-up aircraft cockpit display. Preliminary work in evaluation of several novel concepts showed that a system using 2 concave ellipsoidal reflectors with a common focus and several refracting elements showed considerable promise. Existing computer programs were not adequate to evaluate the image-forming capability of such a system. It was found that in order to extend the state of the art of wide angle display systems, it would first be necessary to extend the state of the art of optical design. A new computer program was developed which permitted the design, automatic correction and the evolution of this complex type of optical system. During the design phase, 2 similar solutions were generated, both of which demonstrated the feasibility of a 25° field. The evaluation of these solutions and detailed design data is included in this report. An engineering model, using 2 ellipsoids and a projection lens, was constructed. A description of the model and its performance is presented herein.

R 8

27,893

Kienholz, D.F., Walker, B.H. & MacRobbie, W. WIDE ANGLE OPTICAL PROJECTION SYSTEM (U). FINAL RESEARCH REPORT. PART II. Contract Nonr 4514(00), Rep. LMEJ 7426, April 1965, 157pp. Light Military Electronics Dept., General Electric Company, Johnson City, N.Y. (AD 471694) (c.f. HEIAS 27,892)

An optical design study was undertaken with the objective of conceiving and proving feasibility of an optical system which would provide a 25° binocular field of view for a typical head-up aircraft cockpit display. Preliminary work in evaluation of several novel concepts showed that a system using 2 concave ellipsoidal reflectors with a common focus and several refracting elements showed considerable promise. Existing computer programs were not adequate to evaluate the image-forming capability of such a system. Therefore, it was necessary to devise a new computer program which would permit the design, utilizing automatic correction and the evolution of this complex type optical system. This computer program was prepared by Scientific Calculations, Rochester, New York, under contract to the General Electric Company.

R 3

27,894

Garvin, P.L. SOME COMMENTS ON ALGORITHM AND GRAMMAR IN THE AUTOMATIC PARSING OF NATURAL LANGUAGES. Report from: "1965 International Conference on Computational Linguistics, Park-Sheraton Hotel, New York, N.Y., 19-21 May 1965." Contract AF 49(638) 1516, AFOSR 65 1383, May 1965, 7pp. Bunker-Ramo Corporation, Canoga Park, Calif. (AD 621159)

The purpose of this paper is to examine the oft-repeated assertion regarding the efficiency of a "simple parsing algorithm" combinable with a variety of different grammars written in the form of appropriate tables of rules. The paper raises the question of the increasing complexity of the tables when more than the most elementary natural-language conditions are included, as well as the question of the ordering of the rules within such nonelementary tables. Some concrete examples from the field of machine translation will be given in the final version of the paper. Some conclusions are presented.

27,895

Gosier, D. PSYCHOLOGICAL OPERATIONS BIBLIOGRAPHY. SUPPLEMENT NO. 7. Contract DA 49 092 ARO 7, Res. Memo. 65 9, Aug. 1965, 40pp. Special Operations Research Office, American University, Washington, D.C. (AD 473882)

This annotated bibliography covers topics such as operations research in government and civilian organizations, strategy and tactics in military operations, and media used (printed matter, radio, films, etc.). (HEIAS)

R 108

27,896

Frase, L.T. VALIDITY JUDGMENTS OF SYLLOGISMS IN RELATION TO TWO SETS OF INDIVIDUAL TERMS. Contract Nonr 3985(04), Proj. NR 154 239, Tech. Rep. 10, Sept. 1965, 71pp. Training Research Lab., University of Illinois, Urbana, Ill. (AD 620904)

The syllogism was used to study the effects of formal logical quantifies and affective verbal terms upon errors, time, and sureness ratings of validity judgments. Words, first rated by 70 Ss on Semantic Differential evaluative scales yielding affective values, were combined into syllogisms to yield 3 levels of response incompatibility. Words also were rated on belief scales, and, in a later session, the syllogistic conclusions containing incompatible or compatible word combinations were rated on both belief and evaluative scales. 32 Ss received relevant syllogistic training; 32 did not. Trained Ss took less time and made significantly fewer errors (on abstract forms) than the untrained group. Relevant training improved validity judgments of syllogisms with particular conclusions. Significantly more errors and a larger amount of time resulted with syllogisms having particular conclusions. Initially, Ss made snap validity judgments on syllogisms that were highly incompatible; later they were more deliberate. A moderate level of incompatibility elicited the greatest N errors. Formal and affective terms had a significant effect on error scores. Formal terms accounted for approximately 27 times as much of the within S variance in time and error scores as the affective terms. Of responses during reasoning, those controlled by formal structural terms were relatively more sensitive to training than the responses controlled by affective terms, and exhibited gross changes.

R 23

27,897

Fraipont, D. VOICE ACTUATED ADDRESS MECHANISM. FIRST QUARTERLY PROGRESS REPORT, 1 MARCH 1965-31 MAY 1965. Contract DA 28 043 AMC 01223(E), Proj. 1P6.20501.A448.02.20, July 1965, 87pp. USA Electronics Command, Fort Monmouth, N.J. (Electronic Associates, Inc., Long Branch, N.J.). (AD 620941)

This report on the simulation of VAAM includes the full design of the preprocessor as implemented on the TR-48 analog computer and also the design of the programs utilized by the Digital Operations System-350. For reasons of efficiency the Phase I effort was broken into 3 tasks. First, recordings of various speakers voicing the vocabulary words were digitized and punched on paper tape. Second, the paper tapes were input to the DDP-24 digital computer to train VAAM to recognize the vocabulary. Third, the reference functions created in the learning task were evaluated by using voiced inputs directly on-line with the full system. It was found that the sample of single voicings by 26 speakers was an inadequate training set for a good extrapolation recognition rate. The extrapolated recognition rate was approximately 55%, ranging from 35 to 80% for different speakers. An attempt at improving results by on-line training pointed out the inefficiency of this mode of operation, and the improvement was small. The conclusions are that the Andromeda approach is feasible but more training is required. The training must be automated by adding some mass storage medium such as digital magnetic tape, to the system.

27,898

Erickson, R.A. VISUAL SEARCH EXPERIMENTS: ACUITY, RESPONSE TIME, NOISE PERSISTENCE. Proj. RM 3731 001/216 1/W107 BO 01, NAVWEPS Rep. 8731, Rep. NOTS TR 3787, July 1965, 46pp. USN Ordnance Test Station, Bureau of Naval Weapons, China Lake, Calif. (AD 619507)

This experiment demonstrated the degradation in search performance resulting from a decrease in the frame rate of a static, structured display containing television-type visual "noise". The display was produced by projecting moving pictures of the static, structured scene; the noise in the scene was obtained by the double exposure and special printing of the film. Results indicate that restricted usefulness of a low frame rate, television-type display may be expected in a low signal-to-noise ratio condition. Neither peripheral and foveal acuity nor eye dominance scores correlated significantly with search time. There was a significant correlation between response time and search time; this is attributed to the mental image processing and decision time common to both tasks.

R 14

27,899

Elias, M.F. SPEED OF IDENTIFICATION OF TELEVISED SYMBOLS AS A FUNCTION OF VERTICAL RESOLUTION. FINAL REPORT. Proj. 5597, Task 559705, RADC TR 65 239, July 1965, 23pp. USAF Display Techniques Branch, RADC, Griffiss AFB, N.Y. (AD 619959)

An experiment was performed to determine the effect of vertical symbol resolution on speed of identification of televised letters and numbers. Ss viewed 36 alphanumeric symbols, 10 times under 7 conditions of symbol resolution (5 to 11 scan lines), and under a solid-symbol (nontelevised) control condition. Performance showed a progressive improvement from 5 to 11 lines, but did not reach a level obtained with solid symbols. It was concluded that 11 lines approaches an optimal level of resolution, and that reduction in symbol resolution much below 11 lines should be approached with caution.

R 11

27,900

Dunlap, D.L. AN ANALYSIS OF ITINERANT AIR TRAFFIC, JACKSONVILLE ARTCC, 1970 & 1975. Proj. 141 411 OIA, Rep. RD 65 89, Aug. 1965, 57pp. US Systems Research & Development Service, FAA, Washington, D.C. (AD 620019)

This report contains forecasts of the itinerant air traffic expected to occur within the Jacksonville ARTCC control area in 1970 & 1975. The forecasts describe annual, peak day, peak hour of peak day, IFR & VFR traffic. 2 possible control area configurations are described. One is the present Jacksonville ARTCC control area; the other is the combined Jacksonville-Miami ARTCC control areas. A plausible configuration of the peak hour traffic is described in terms of abbreviated flight plans which indicate type of aircraft, true air speed, origin, time of entrance into the control area, destination, and route of flight.

R 9

27,901

Computer Usage Company, Inc. SERIAL LIBRARY SYSTEM. Contract OI 18 064 D5 00036(A), 1965, 64pp. USA Biological Labs., Fort Detrick, Frederick, Md. (Computer Usage Company, Inc., Baltimore, Md.). (AD 621067)

A computer program for the UNIVAC SS90-11 has been developed to process serial records encompassing various functions such as: acquisition, routing, binding, supplier's lists and accumulative holdings.

27,902

Chia-sung, L. OPTICAL COMMUNICATIONS. FTD TT 65 95/1+2+3+4, June 1965, 9pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: K'io Hsueh Ta Chung (Chinese), 1964, 2, 46-47, p64). (AD 621053)

A new method for long-range optical communication, the laser, is the subject of this paper. The problems of effectively modulating the amplitude and frequency of lasers in order to provide sufficient long-range intensity and variation in frequency are considered. Sources of transmission loss and means of reducing these are indicated. Finally, the reception of the optical signal at its destination and its reconversion into an electrical signal is described relative to the techniques and devices employed: photomultiplier device, prism-and-phototube receiver, and optical heterodyne receiver. Some future applications for optical communications are indicated, e.g. ultra-long distance communication in outer space.

27,903

Chipault, J.R. & Hawkins, J.M. OXIDATION CHANGES AFFECTING ODOR AND FLAVOR OF FREEZE-DRIED MEATS. FINAL REPORT, 16 MAY 1962-15 MAY 1964. Contract DA 19 129 QM 1594, Proj. 7 84 06 031, Tech. Rep. FD 11, May 1965, 55pp. USA Natick Labs., Natick, Mass. (Hormel Institute, University of Minnesota, Austin, Minn.). (AD 619440)

Samples of commercially-prepared freeze-dried cooked and raw beef, raw pork, raw fish and shrimp have been examined in a Warburg apparatus and their oxygen absorption characteristics have been measured. The moisture content, glyceride fat and bound lipids have been determined also. The oxidation of these materials appears to be complex. It is a 2-step process involving first oxidation of the bound lipids, followed, after a variable period of lower oxygen absorption, by oxidation of the glyceride fat. The rates of oxidation during these 2 steps and the length of the period of low oxygen absorption between them are determined by the nature and history of the sample.

R 3

27,904

Carhart, R. CONSIDERATIONS IN THE MEASUREMENT OF SPEECH DISCRIMINATION. Review 3 65, June 1965, 22pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 473572)

The purpose of this paper is to review factors that contribute to the confusion regarding the use and interpretation of monosyllabic word lists (PB-50 tests) as measures of speech perception. It reviews some of the criteria for choosing test materials, selected aspects of test presentation, the margins of uncertainty resident in discrimination tests, the application of these materials to otologic diagnosis, and their use in evaluating a patient's difficulties in everyday hearing and in assessing the practical significance of rehabilitative procedures. It examines ways by which otologists and audiologists can stabilize measurement of speech discrimination and unify their interpretation of its results.

R 23

27,905

Broadbent, D.E. & Burns, W. EFFECTS OF NOISE ON HEARING AND PERFORMANCE. R.N.P. 65/1057, April 1965, 19pp. Royal Naval Personnel Research Committee, MRC, London, England. (Applied Psychology Research Unit, MRC, Cambridge, England & Physiology Dept., Charing Cross Hospital Medical School, London, England). (AD 473693)

This paper briefly considers the physical dimensions of sound--frequency, pressure, etc.--and audiometric techniques and data as introductory material to the main topic--the effects of noise on man. These effects are discussed in 4 categories: interference with communication by speech, either direct or via telephone; impairment of efficiency in the performance of tasks; interference with rest or sleep; and temporary or permanent effects on the body, particularly on the mechanism of hearing.

R 46

27,906

Blakeslee, D.J., Huff, L.W. & Kickert, R.W. VILLAGE SECURITY PILOT STUDY, NORTHEAST THAILAND. Rep. 65 016, May 1965, 387pp. Thai-US Military Research & Development Center, Bangkok, Thailand. (AD 473593)

This pilot study, involving the design and testing of a methodology, attempts to develop a data base of information related to problems of village security in remote areas. It is essentially descriptive rather than analytic, but examples of the potential analytic value of a data base are given. Focus is on those physical characteristics of villages which are likely to be relevant to village security. Village geometry and resources available to villages are of primary concern. The test area, comprising 2 section and containing 40 villages, is located in Udon Province. A questionnaire was used. Its major information categories were: a) general and locational, covering names of village officials, population, UMT coordinates, latitude and longitude, distances to nearest neighboring villages, police posts and military bases; b) defense perimeters, concerned with village areas and shapes, and fields of view; c) internal characteristics, including lane and compound fences, vehicle population, fuel storage, export and import, local industries, weapons, residents classed by skills, tools, and the animal population; d) external transportation, primarily village proximity to road, railroad, river, stream, or canal transport; and e) characteristics of each village's immediate, local zone of influence, including construction materials, cultivated land, soil types, and general topography.

R about 60



27,907  
 Botvinnikov, B.A., Ginzburg, I.Sh., et al. INFLUENCE OF ELEVATED INTRAPULMONARY PRESSURE ON RESPIRATION AND CIRCULATION. FTD TT 65 154/1+2, June 1965, 69pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Funktsii Organizma v Usloviyakh Izmenonnoy Gazovoy Sredy (Russian), 1955 1, 118-160). (AD 620970)

In summing up the results obtained, we must conclude that, from the standpoint of changes in respiration and circulation, elevated inhalation and exhalation pressure imposes greater requirements on the cardiovascular and respiratory systems than intermittent pressure during exhalation. We must also note the extremely high resistance of dogs to elevated intrapulmonary pressure. These animals are capable of withstanding not only pressures of up to 30-35 mm Hg, but even those of up to 50 mm for prolonged periods with no critical disruptions of bodily functions. These data are interesting because such intrapulmonary pressures exceed the normal blood pressure in the capillaries of the pulmonary circulatory system. The increased blood-flow resistance is nevertheless obviously overcome by the intensification of the functioning of the right ventricle. These facts consequently again indicate the extremely strong functional reserves of the organism, which enable it to maintain its viability under very unfavorable conditions.

R 11

27,908  
 Bazhinov, I.K. METHOD OF SELF-CONTAINED NAVIGATION DURING FLIGHTS IN ORBITS NEAR PLANETS. FTD MT 65 148, June 1965, 11pp. USAF Translation Div., Wright Patterson AFB, Ohio. (Transl: (Russian), 1965, 1-15). (AD 619479)

The basic navigational problems of spaceships flying in orbits near planets are delineated and a self-contained solution, i.e., one independent of ground command, is considered. This requires astronavigational observations, flight altitude measurements, and relatively simple calculations using special navigational tables. The method was demonstrated for the case of a ship flying a selenocentric orbit the plane of which is close to the plane of the equator of the moon. Some observations and data on this type of navigation obtained during Voskhod flights are also summarized.

27,909  
 Bendix Corporation. IN-FLIGHT DECISION SYSTEM. FINAL REPORT. Contract Now 64 0448 d, June 1965, 73pp. Bendix Radio Div., Bendix Corporation, Baltimore, Md. (AD 621148)

This report concerns the development of a system which will automatically recognize the presence of a target in a clutter or camouflaged background and will provide information suitable for missile terminal phase guidance systems. 2 of the problems dealt with were: a) the processing of signals or images to reduce noise and extract pertinent parameters; and b) the design of recognizers to handle the processed data. Aside from computer simulation studies and the design and testing of recognizers, a neural network simulation and study program was conducted. The purpose was to investigate the feasibility of using artificial nerve cells in the construction of pattern recognizers and property filters. The ability to learn simple discrimination tasks and retain various amounts of prior learning in the presence of new learning resulted from the tests conducted with a number of experimental systems. (HEIAS)

27,910  
 Bryan, A.C., Machamara, W.D., Simpson, J. & Wagner, H.N. EFFECT OF ACCELERATION ON THE DISTRIBUTION OF PULMONARY BLOOD FLOW. J. appl. Physiol., Nov. 1965, 20(6), 1129-1132. (RAF Institute of Aviation Medicine, Toronto, Ontario, Canada).

The distribution of pulmonary blood flow has been measured during increased positive (+G<sub>z</sub>) acceleration. Macroaggregated albumin labeled with iodine 131 was injected intravenously during centrifugal acceleration, by the method described by Wagner and co-workers. The particles embolize the pulmonary vascular bed in proportion to flow and can be subsequently detected by scintillation scanning of the lung. One study was done in one subject in one of five following conditions: supine, seated, +2 G<sub>z</sub>, +3 G<sub>z</sub>, and +4 G<sub>z</sub>. The results show a progressively smaller reduction in upper zone perfusion with increasing acceleration agreeing with hydrostatic principles. Flow increased in the base up to +2 G<sub>z</sub> but thereafter becomes fixed, suggesting that the vessels were then maximally dilated. The gas exchange consequences of these changes of perfusion are discussed indicating that there must also be ventilatory changes.

R 15

27,911  
 Hood, W.B., Jr. & Higgins, L.S. CIRCULATORY AND RESPIRATORY EFFECTS OF WHOLE-BODY VIBRATION IN ANESTHETIZED DOGS. J. appl. Physiol., Nov. 1965, 20(6), 1157-1162. (USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio).

Effects of whole body x-axis sinusoidal vibration were studied in 27 anesthetized dogs. At a vibratory frequency of 10 cps and at levels of peak acceleration greater than 0.3 g, increases in the accelerative force of vibration were accompanied by increases in M arterial blood pressure, heart rate, cardiac output, oxygen consumption, central blood volume, and minute volume of ventilation. Peripheral vascular resistance decreased under the same conditions. At 6 cps similar results were obtained, the only significant differences being in blood pressure and heart rate response. In 3 animals curare partially blocked the increase in oxygen consumption during vibration. Reserpine had no effect in 2 other animals. These studies suggest that the circulatory responses observed during wholebody vibration are due to muscular exercise.

R 27

27,912  
 Chiang, S.T., Steigbigel, N.H. & Lyons, H.A. PULMONARY COMPLIANCE AND NONELASTIC RESISTANCE DURING TREADMILL EXERCISE. J. appl. Physiol., Nov. 1965, 20(6), 1194-1198. (Pulmonary Lab., State University of New York Downstate Medical Center, Brooklyn, N.Y.).

Transpulmonary pressure, respiratory flow, and tidal volume of 7 normal Ss were measured at rest and during treadmill exercise on the level at a speed of 1.5 mph. Pulmonary compliance remained unchanged during exercise. Nonelastic resistance showed an insignificant increase (0.9-1.4 cm H<sub>2</sub>O per liter per sec.). Examination of other parameters which may affect compliance were made. Functional residual capacity decreased 120-200 ml during exercise, tidal volume doubled, and respiratory frequency increased 43.5%, yet none of these factors affected the lung compliance. The phenomenon of second wind was experienced by 4 of the Ss, and nothing was observed to explain its occurrence during exercise.

R 19

27,913

Jacquemin, C., Demange, J., Timbal, J. & Varene, P. EFFECTS OF FORWARD ACCELERATION ON ANATOMICAL DEAD SPACE. *J. appl. Physiol.*, Nov. 1965, 20(6), 1205-1210. (Laboratoire de Médecine Aérospatiale, Bretigny-Sur-Orge, Seine et Oise, France).

The effects of transverse acceleration (1-5 G) on anatomical dead space have been studied on 4 human Ss. Instantaneous analysis of expired gases has been done by mass spectrometer. Half deflection between inspired gases and alveolar plateau levels is considered as the signal for the end of dead-space sweep. It is confirmed that no obstructive syndrome occurs during these accelerations. The airway size is not reduced; on the contrary, the anatomical dead space increases with the level of accelerations. Furthermore, a decreasing slope of the CO<sub>2</sub> alveolar plateau has been noted on 2 Ss. These facts can be interpreted admitting a passive displacement of the pulmonary blood mass under influence of forward acceleration and the adjustment of ventilation to perfusion.

R 30

27,914

Jarrett, A.S. EFFECT OF IMMERSION ON INTRAPULMONARY PRESSURE. *J. appl. Physiol.*, Nov. 1965, 20(6), 1261-1266. (RAF Institute of Aviation Medicine, Farnborough, Hants, England).

Pressure-volume relaxation curves have been determined for relaxed, breath-holding Ss lying and sitting in air and water. Immersion in water resulted in a marked increase in intrapulmonary pressure, the whole pressure-volume curve appearing to be shifted along the pressure axis. From the regression equations of the 4 curves the pressures at normal relaxed chest volume were calculated, and the center of pressure of the immersed chest shown to lie 19 cm below and 7 cm behind the sternal angle. The significance of this to the positioning of a diver's demand valve is discussed.

R 11

27,915

Keller, H. & Bühlmann, A.A. DEEP DIVING AND SHORT DECOMPRESSION BY BREATHING MIXED GASES. *J. appl. Physiol.*, Nov. 1965, 20(6), 1267-1270. *J. appl. Physiol.*, Nov. 1965, 20(6), 1267-1270. (Internal Medicine Dept., University of Zurich, Zurich, Switzerland).

A series of test dives carried out by 14 Ss in depths between 130 & 1,000 ft. for periods varying between 5 min and 2 hr revealed that changes of the inert gas in the breathing mixture permit a considerable shortening of the decompression time. The physical and physiological basis of the method is discussed.

R 4

27,916

Petajan, J.H. & Daube, J.R. EFFECTS OF COOLING THE ARM AND HAND. *J. appl. Physiol.*, Nov. 1965, 20(6), 1271-1274. (Physiology & Neurology Depts., University of Wisconsin Medical Center, Madison, Wisc.).

This study undertakes to: a) quantify the effects of immersion of the arm and hand in 10 C water for 15 min on the conduction velocity of the median nerve, the action potential of the thenar muscles, and rapid successive apposing movements (RSM) of the thumb; and b) determine whether or not habituation by daily 15 min cold exposure of the arm and hand for 5 weeks is reflected in any alteration of the aforementioned parameters. 10 young adult Ss were studied. All parameters of function were grossly impaired by the cooling. A roughly linear dependence upon thenar temperature was found for the latency of response and the duration of the negative spike of the action potential. RSM increased logarithmically with increasing thenar temperature. In 2 repeatedly exposed Ss, RSM improved slightly under all conditions which was felt due to learning. More frequent cyclic vasodilatation and more rapid finger tip warming was observed. No significant difference in conduction velocity between control and habituated Ss was found.

R 10

27,917

Haslag, Wilma M. & Hertzman, A.B. TEMPERATURE REGULATION IN YOUNG WOMEN. *J. appl. Physiol.*, Nov. 1965, 20(6), 1283-1288. (Physiology Dept., St. Louis University School of Medicine, St. Louis, Mo.).

Possible sexual differences in the regulation against acceptable heat loads were studied by exposing female and male Ss to rising ambient temperature,  $T_a$  (1 hr at 25 C, then 6.6 C/hr to 45 C) or to steady  $T_a$  (43.3 C for 3 hr). Women were studied during the menstrual, preovulatory, and postovulatory periods. Oral ( $T_o$ ) and skin ( $T_s$ ) temperatures, cutaneous opacity pulses, regional sweating rates, and weight losses were measured. During the menstrual and preovulatory periods, the thermoregulatory responses of women were similar to those of men except for slightly larger cutaneous opacity pulses and greater rates of weight loss in several of the male Ss. The  $T_o$ , but not  $T_s$ , was consistently higher in women during heat exposures in the postovulatory period. Of several possible explanations, a higher setting of the hypothalamic thermostat seems the more probable reason for the elevation of  $T_o$  without a corresponding increase in weight loss, regional sweating, and cutaneous opacity pulses. In other respects there were no essential differences in temperature regulation attributable to sex.

R 18

27,918

Zobl, E.G., Talmers, F.N., Christensen, R.C. & Baer, L.J. EFFECT OF EXERCISE ON THE CEREBRAL CIRCULATION AND METABOLISM. *J. appl. Physiol.*, Nov. 1965, 20(6), 1289-1293. (US Veterans Administration Hospital, Cardiac Research Lab., Dearborn, Mich.).

Cerebral hemodynamics and metabolism were studied in 13 normal patients and 14 hypertensive patients at rest and during vigorous physical exercise. Cerebral blood flow was determined by the nitrous oxide method. The cerebral vascular resistance in normal and hypertensive patients remained remarkable constant during exercise despite a marked reduction in total peripheral resistance. Cerebral blood flow was relatively unaffected by the marked increase in cardiac output and the cerebral metabolism did not share in the increased total body metabolism. During vigorous physical exercise the brain behaved as a steady-state organ.

R 37

27,919  
Grimby, G. RENAL CLEARANCES DURING PROLONGED SUPINE EXERCISE AT DIFFERENT LOADS. *J. appl. Physiol.*, Nov. 1965, 20(6), 1294-1298. (Clinical Physiology Dept., University of Goteborg, Goteborg, Sweden).

Clearance of inulin ( $C_{in}$ ) and para-aminohippuric acid ( $C_{PAH}$ ), cardiac output,  $O_2$  uptake, and arterial blood pressure were measured in 15 healthy male Ss at rest and during supine exercise of 45 min duration on a bicycle ergometer. Work loads between 150 & 900 kpm/min were chosen.  $C_{PAH}$  decreased with increasing work intensity (heart rate). At an  $O_2$  uptake corresponding to half of the aerobic work capacity it was about 70% and at heavy work 35-45% of the value at rest. The renal fraction of the cardiac output averaged, at rest, 17% and decreased with increasing work loads to 2.5-5% as a minimum.  $C_{in}$  did not change significantly until heavy exercise was performed. The filtration fraction increased during exercise.

R 17

27,920  
Wasserman, K., Burton, G.G. & Van Kessel, A.L. EXCESS LACTATE CONCEPT AND OXYGEN DEBT OF EXERCISE. *J. appl. Physiol.*, Nov. 1965, 20(6), 1295-1306. (Respiratory Function Lab., Stanford University School of Medicine, Palo Alto, Calif.).

The Huckabee concept that excess lactate (XL) is equivalent to the  $O_2$  debt of exercise and physiological phenomena derived therefrom, were investigated. Measurements of  $O_2$  debt, arterial blood lactate and XL, and  $O_2$  consumption were made during cycle ergometer exercise of controlled intensity and duration. Our results indicate: a) The  $O_2$  equivalents of XL as well as  $\Delta$  lactate are less than the  $O_2$  debt, at all work loads; b) The concentration of XL does not linearly increase during exercise; c) The anaerobic metabolic rate whether calculated from XL or  $O_2$  debt is not a constant fraction of the metabolic rate, at all work loads. A larger fraction of energy is derived from the  $O_2$  debt creditors at heavy and very heavy than at moderate work loads; d) In 30 controlled work-load exercise studies of prolonged duration, XL did not contribute any information not revealed by lactate itself; e) The differences between Huckabee's results and those of our own are not due to differences in the measurement of XL but rather to differences in the directly measured  $O_2$  debt.

R 31

27,921  
Richardson, Martha. EFFECT OF REPETITION ON THE ENERGY EXPENDITURE OF WOMEN PERFORMING SELECTED ACTIVITIES. *J. appl. Physiol.*, Nov. 1965, 20(6), 1312-1318. (US Agricultural Research Service, Housing & Equipment Lab., Washington, D.C.).

21 typical homemaking tasks were performed by physiologically "normal" women 2-6 times/day, several days per week. Results from these studies are appraised from the standpoint of the possible "learning" effects of repeated performance of the same task. Energy expenditures for sitting and standing quietly and for 8 of 21 activities showed no significant decrease with a repetition of trials, presumably because the work conditions were already familiar to the Ss. For 13 of the activities, significant decreases in energy expenditure resulted with increasing number of times the task was performed, and the negative relationships were plotted. Rates of decrease appeared to vary according to the type of basic component movements involved in each task, e.g., manipulatory as compared with travel components. Data from studies of 8 of the 13 tasks were fitted by quadratic and quartic curves, an indication of interruptions in the effects of repetition.

R 13

27,922  
Moncloa, F., Gómez, María & Hurtado, A. PLASMA CATECHOLAMINES AT HIGH ALTITUDES. *J. appl. Physiol.*, Nov. 1965, 20(6), 1325-1331. (Universidad Peruana de Ciencias Médicas y Biológicas, Lima, Peru).

High altitude native residents and newcomers to a low ambient pressure (36 hr after arrival) have normal plasma levels of adrenaline and noradrenaline in the fasting condition. 30 min. after the intravenous injection of insulin the high-altitude residents show increase of epinephrine greater than in men living at sea level. These results are interpreted as a consequence of the lower glucose values observed at high altitudes.

R 17

27,923  
Feller, R.P., Sharon, I.M., Chauncey, H.H. & Shannon, I.L. GUSTATORY PERCEPTION OF SOUR, SWEET, AND SALT MIXTURES USING PAROTID GLAND FLOW RATE. *J. appl. Physiol.*, Nov. 1965, 20(6), 1341-1344. (Tufts University School of Dental Medicine, Boston, Mass.).

The reflex secretion of parotid saliva was utilized to evaluate the stimulatory action of various taste mixtures on human gustatory chemoreceptors. Test solutions consisted of citric acid, sucrose, and sodium citrate. Rates of secretion were determined by measuring the volume produced by a standardized application procedure. The response elicited by the different solutions was determined. The effect of one modality upon another was then studied by combining 2 solutions at each of 4 concentrations. Results showed that the addition of citric acid or sodium citrate to sucrose produced a response equal to the sum of the separate constituents. The flow rate obtained from mixtures of citric acid and sodium citrate was less than the sum of the individual components. This apparently was due to the buffering effect causing a decreased hydrogen ion concentration. Although the hydrogen ion concentration decreased to subthreshold levels, the salivary gland secretion rate was still responsive to variations in hydrogen ion concentration, indicating a synergistic effect when hydrogen and sodium ions were present in the same solution.

R 12

27,924  
Richardson, T.W., Aprison, M.H. & Werman, R. AN AUTOMATIC DIRECT-CURRENT OPERATING TEMPERATURE-CONTROL DEVICE. *J. appl. Physiol.*, Nov. 1965, 20(6), 1355-1356. (Psychiatric Research Institute, Indiana University Medical Center, Indianapolis, Ind.).

Krnjevic and Mitchell described a circuit for maintaining constant body temperatures of experimental animals under moderate anesthesia. 2 major advantages in the design of this device were its small size and the absence of any a-c field or inductive components. Certain modifications are now described which improve the performance and reliability of the device.

R 1

27,925

American Psychological Association. PROCEEDINGS OF THE 73RD ANNUAL CONVENTION OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION. July 1965, 371pp. American Psychological Association, Washington, D.C.

Papers of the divisions of experimental, physiological, clinical, educational, and counseling psychology which were presented at the American Psychological Association meetings in 1965 are contained in this volume. (HEIAS)

R (many)

27,926

Prince, A.I. GENERALIZATION GRADIENTS AND ANTICIPATED MAGNITUDE OF REINFORCEMENT. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 7-8. Evansville College, Evansville, Ind.

The present experiment was designed to evaluate a factor, magnitude of reinforcement, by assessing the effects of various amounts of monetary reward on 2 types of generalization gradient (nonsense syllables and adjectives). Both stimulus and mediated generalization increase as a function of increases in the magnitude of anticipated reinforcement and decrease as the degree of similarity between test and conditioned stimuli declines. (HEIAS)

R 5

27,927

Freedle, R.O. RESPONSE BIAS IN A MODIFIED SHANNON GUESSING GAME. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 11-12. American Institutes for Research, Washington, D.C.

To determine whether Ss' guesses reflect the uncertainty structure of language when words are the response unit, the extent to which Ss (responding in a Shannon-type guessing game) agreed with the "true" probabilities of occurrence of groups of words that occur in the first 5 ordinal positions in sentences taken from short stories was assessed. Ss tended to underestimate high-frequency words and over-estimate low-frequency words when guessing the first words of sentences. When 4 or more words were guessed, however, the Shannon technique provides a fairly accurate estimate of the structure of the English language. (HEIAS)

R 4

27,928

Herman, L.M. & Bahrick, H.P. EFFECTS OF INFORMATION ENCODING ON DECISION EFFECTIVENESS. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 13-14. Queens College, Charlotte, N.C. & Ohio Wesleyan University, Delaware, Ohio.

Ss were asked to choose among all paired comparisons of a set of 10 alternative wagers. 2 different methods of encoding the decision-parameter information were investigated: a display of 4 elements and a subset of 2 elements. The 4-element display reduced the probability that S will achieve an apparent EV-maximization rule, since more arbitrary decision rules were available to S under this encoding method.

R 7

27,929

Driscoll, J.M. & Lanzetta, J.T. OVERTLY NONINSTRUMENTAL INFORMATION SEARCH AS A FUNCTION OF OUTCOME UNCERTAINTY AND DELAY. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 15-16. Research on Social Behavior Center, University of Delaware, Newark, Del.

The purpose of the present study was to examine notions of outcome uncertainty and its effects on overtly noninstrumental search behavior, with the prediction that search would increase monotonically with increasing delay since the longer the delay the longer S must tolerate uncertainty. Overall, the experimental results confirm the prediction. (HEIAS)

R 9

27,930

Andrews, R.S., Jr. & Boldt, R.F. DISCRIMINATION, CONFIDENCE, AND PAYOFF IN A PERCEPTUAL-DECISION TASK. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 17-18. USA Personnel Research Office, OCRD, Washington, D.C.

In the present study, the effects of numerosness, visual angle, and cost of information are examined in the context of a perceptually based decision task. The purpose was to determine whether previous findings in the perceptual domain hold under the imposition of decision task and, conversely, whether findings in the decision-making area can be extended from intellectual to perceptual tasks. Estimated number and confidence functions were reasonably similar to those reported in earlier discrimination studies. Though confidence was positively related to accuracy it was not a good predictor of performance and did not seem to operate as a decision catalyst. (HEIAS)

R 10

27,931

McFarland, J.H. THE EFFECT OF DIFFERENT SEQUENCES OF PART PRESENTATION ON PERCEPTION OF A FORM'S PARTS AS SIMULTANEOUS. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 43-44. University of Denver, Denver, Colo.

It was hypothesized that sequentially presenting the same parts of a form in different spatial orders will lead to different limiting intervals for simultaneity, namely, thresholds for succession. In Exp. 1, the stimulus was a luminous equilateral line triangle. Sides were presented sequentially and S reported whether the sides appeared simultaneous or successive. In Exp. 2, a 3 letter word was employed as the stimulus form. Results of other experiments indicate that perceptual analysis proceeds in a clockwise direction, whether the stimulus be a word or geometric form. (HEIAS)

R 5

27,932

Levy, R.M. THE EFFECTS OF STIMULUS DIMENSIONALITY ON INFORMATION PROCESSING. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 47-48. University of Connecticut, Storrs, Conn.

In the present study, time rate of information transmission,  $T$ , was calculated as the ratio of amount of information transmitted,  $H_t$ , to choice reaction time, CRT. Horizontal and vertical lengths of line provided 2 single dimensions. Multidimensional stimuli were crosses. A redundant set was created by combining each of the lengths of line of the horizontal set with the same member of the vertical set. The redundant condition had a higher rate of information transmission than the single dimension. Bidimensionality decreased processing time and increased amount of information processed. (HEIAS)

R 5

27,933

Foley, J.M. VISUAL SPACE: A SCALE OF PERCEIVED RELATIVE DIRECTION. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 49-50. University of California, Santa Barbara, Calif.

The present study is concerned with examining the assumption that perceived angle between the directions of 2 points equals the difference between their bipolar azimuths. 3 methods were used to measure the perceived size of angle between lines of direction. These were the methods of fractionation, magnitude estimation, and magnitude production. A scale was constructed from the fractionation data. The results of the study are not consistent with Luneburg's assumption that the perceived azimuth equals the bipolar azimuth. Each of the 3 methods indicates that the form of the relation between perceived angle and physical angle is approximately linear.

R 4

27,934

Rotter, G.S. TIME RATE AS AN INDEPENDENT VARIABLE IN RESEARCH. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 51-52. Long Island University, Brooklyn, N.Y.

The present experiment explored a number of reactions believed to be affected by clock speed. Clock speed influenced  $Ss'$  estimates of the speed of time. Slowing down the clock did not serve to decrease  $Ss'$  interest in reading material. It is postulated that the sense of time rate possesses 2 separate dimensions. The first is emotional, relying largely on internal cues. The second might be labelled judgmental.

R 6

27,935

Rice, C.E. & Feinstein, S.H. THE INFLUENCE OF TARGET PARAMETERS ON A HUMAN ECHO-DETECTION TASK. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 65-66. Stanford Research Institute, Menlo Park, Calif.

To test the hypothesis that the sonar-like detection skill is more closely related to the horizontal dimension of a target than to its area or shape, an experiment was performed which used rectangular targets of constant area. Blind  $Ss$  used vocal sonar signals. Apparently, the horizontal or vertical orientation of targets does not differentially affect the detection task. The ability to detect objects is positively correlated with the amount of energy reflected by the target surface.

R 4

27,936

Crovitz, H.F. & Schiffman, H. IDENTIFICATION AND LOCALIZATION EFFECTS IN IMMEDIATE MEMORY. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 75-76. US Veterans Hospital, Durham, N.C. & Duke University, Durham, N.C.

The present series of studies examines the separate roles of identification and localization in determining the form of error function in the letter span. 7-item letter lines were presented for 100 msec. in 3 visual-field placements: a) extending from the fixation point to the left visual field; b) extending from the fixation point into the right visual field; and c) symmetric about the fixation point. Thus, the latter condition had the stimuli extended across the center of the visual field. 3 different groups of undergraduate  $Ss$  were used. In the first experiment, the procedure of Crovitz and Schiffman was used;  $S$  was to record the letters he had seen in their correct location ( $N=12$ ). In the second,  $S$  was to ignore relative location of letters within the letter line and merely identify the letters he had seen ( $N=16$ ). In the third,  $S$  was freed from having to identify as many letters as he could; instead, he was told what letter to look for. His task was to report the location in which it appeared within the string of letters ( $N=14$ ). The 3 experiments show a bow-shaped error function over positions of letters in the line of 7 letters when the left-most, middle- or right-most letter is presented to the fovea regardless of which task  $S$  performed. The error function thus derives from a gradient of identifiability. It was also found that localization errors, given prior identification of an item, are skewed to the right of the letter line.

R 2

27,937

Nickerson, R.S. RESPONSE TIMES WITH A MEMORY-DEPENDENT DECISION TASK. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 77-78. USAF Decisions Sciences Lab., L.G. Hanscom Field, Bedford, Mass.

This experiment was addressed to the question of whether the time required to search a visual display would be determined not only by the amount of material which must be looked at but also by the nature of the material which must be looked for.  $Ss$  (21 female undergraduates) were shown 2 sets of letters on a visual display, the task was to decide (by pressing 1 of 2 keys) whether or not any of the first set were included in the second. Independent variables were number of letters in each list and number in common to both. RT and error frequency measures were obtained. RT was found to increase with increases in number of letters in both the first and second lists; also RT was greater for the no than yes responses. False negative responses outnumbered false positive by about 2 to 1 for multi-item lists with only 1 item common. The results suggest a search process which is not exhaustive regardless of whether or not it should be.

R 2

27,938

Glucksberg, S. & Laughery, K.R. SEQUENTIAL MEMORY AS A FUNCTION OF TOTAL TIME OF INFORMATION EXPOSURE AND AVAILABILITY OF INFORMATION-PROCESSING STRATEGIES. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965," July 1965, 79-80. Princeton University, Princeton, N.J. & State University of New York, Buffalo, N.Y.

The present study examined the distinction between paired-associate and sequential types of memory tasks by evaluating the effect of information-exposure time in a sequential task. Ss' (40 undergraduates) task was to report the number of times each of 4 consonants occurred in sequences of varying length: 8, 12, 16, and 20 letters at the rate of 1 per 2 sec. and on-off ratios of 1.9 to 0.1 and 0.1 to 1.9; also instructions concerning various memorization strategies, e.g. categorizing, incrementing were given. Error scores were examined by analysis of variance technique. Performance is markedly superior in the low-ratio on condition and this superiority increases with sequence length. The data support the distinction between the sequential and incremental type of task, i.e. the effects are precisely opposite. The patterns of interactions (instructions, on-time, sequence length, and practice) indicate that Ss do very little else while attending to informational stimuli even after acquiring the information. The question of how to alter this behavior is posed for future interest.

R 5

27,939

Bruce, D. & Cofer, C.N. A COMPARISON OF RECOGNITION AND RECALL IN SHORT-TERM MEMORY. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965," July 1965, 81-82. Pennsylvania State University, University Park, Penn.

These experiments determined the shape of the recognition curve for verbal units falling within the span of immediate memory as a function of length of retention interval, and compared recall and recognition as measures of retention. Ss (30 undergraduates) were presented CCC trigrams followed by a 3-digit number; they then repeated the number and counted backwards by 3's or 4's until the recall cue was given: 1 group tried to recall the trigram, a second tried to recognize it among 5 structurally similar syllables, and a third among 5 dissimilar syllables. 6 retention intervals: 3, 6, 9, 12, 15, and 18 sec. were tested. Both recognition groups were superior to recall and the low similarity was superior to the high. The second experiment was a slightly modified repeat of the first to further examine differences in these and other researchers results.

R 5

27,940

Laughery, K.R., Lachman, R. & Dansereau, D. SHORT-TERM MEMORY: EFFECTS OF ITEM-PRONUNCIATION TIME. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965," July 1965, 83-84. State University of New York, Buffalo, N.Y.

"This study tested the hypothesis that recall in short-term memory will decline as the number of syllables per item is increased. The experiment was designed to keep Ss' response time constant for items varying in syllable length. This was accomplished by having some Ss respond by drawing a picture of each stimulus while the names of the stimuli varied in syllable length." 46 Ss were used. 28 common figures (14 1-syllable, 14 multi-syllable names) were the stimulus items; these figures were made up into slides and into lists (single, multiple, and mixed syllable names). Ss were instructed to remember and record their responses (figure or word) at the end of each list presentation. Errors per list type and response mode were examined as well as response times. The results clearly show that recall errors covary with the number of syllables in the figure names.

R 4

27,941

Loess, H. & McBurney, Judith. SHORT-TERM MEMORY AND RETENTION-INTERVAL ACTIVITY. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965," July 1965, 85-86. College of Wooster, Wooster, Ohio.

This study examined the assumptions about retention interval activity based on the inverse relationship between task similarity (experimental and intervening) and interference in subsequent short-term memory. 120 Ss, divided into 6 groups, performed active or passive and interfering or noninterfering tasks during the retention intervals; which followed the presentation of sets of triads on trigrams. It was found that short-term retention of both triads and trigrams was dependent upon the nature of the intervening task--active (S's involvement), dissimilar (type of material) tasks resulted in poorer retention than unfilled intervals or intervals with tasks which did not demand S's complete attention.

R 8

27,942

Dominowski, R.L. ANAGRAM SOLVING AS A FUNCTION OF BIGRAM RANK AND WORD FREQUENCY. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965," July 1965, 87-88. Northwestern University, Evanston, Ill.

Anagram solving was studied as a function of 3 levels of word frequency, 3 levels of word bigram rank (BR), combined in a 3x3x2 factorial design. Interactions were of interest because subword (bigram) variables might be expected to have different effects on the solution of words differing in their probabilities of being produced as whole units. Higher word frequency resulted in more solutions, which is consistent with previous results and predicted by the spew hypothesis. If S emits words in order of their frequency, then, with a fixed amount of time per problem, high frequency solutions will be produced more often. Generally, low-BR words were solved more often than words with higher bigram-rank totals. This suggests that the likelihood of producing a given bigram as part of an anagram solution is dependent on the number of more frequent, incorrect bigrams with a common (initial) letter. With fewer interfering bigrams (low BR), difficulty decreases. This analysis must be qualified because of reversals which occurred and changes with word frequency. Bigram effects were expected to vary with word frequency, but the form of the interaction requires further study. More solutions were produced from anagrams with high bigram-rank totals. Since these have less strength, they are more likely to be reorganized.

R 8

27,943

Denton, W.B. MEMORY FOR PAST INSTANCES AND HYPOTHESIS-REVISION PROCEDURES IN HUMAN AND COMPUTER CONCEPT LEARNING. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 89-90. University of Michigan, Ann Arbor, Mich.

The present investigation reports the results of two computer and human experiments: information-processing behavior following an error, and the memory of past stimulus instances necessary for: a) optimum performance and b) performance which is a close simulation of human performance. 88 Ss each received 2 concept problems; 12 computer runs were obtained for each of 4 concept problems. In 1 some stimulus instances were found much more difficult to classify: Restle's hypothesis-revision procedure produces a good simulation on the 2 easier concept problems but does poorly on the 2 more difficult ones; the alternative-hypothesis-revision procedure does relatively well on all 4 problems. An  $r$  of .793 was obtained between the human and computer correct responses. In 11 using the same Ss and concept problems, only the selective-hypothesis procedure was run on the computer. Generally only the letter from the most recent 2 trials need to be remembered by the computer program in order to produce performance which closely approximates that of humans.

R 7

27,944

Greenbaum, C.W., Rakover, S. & Stein, B. THE PREDICTION OF BEHAVIOR FROM VERBAL HYPOTHESES UNDER TWO INSTRUCTIONAL SETS. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 91-92. Hebrew University, Jerusalem, Israel.

It is the purpose of this study to test a more direct method of applying a theory of verbal control to predict correct placements from hypotheses and to test this method under 2 instructional sets. The Ss were instructed either: a) to maximize--that is, to attempt to gain as many reinforcements as possible, in addition to searching for the correct rule; or b) to attempt to discover the correct rule only, without mention of maximizing number or reinforcements. Our hypothesis was that the maximizing instructional set would lead to more variability in hypotheses and to greater possibility for dissociation between hypotheses and placement. For each block of trials, the average probability of success or proportion of overlap with the correct rule as directly computed would constitute a prediction by a theory of verbal control of the proportion of correct placements. A higher proportion of correct placements could thus be taken as the effect of the automatic action of the reinforcer. 24 Ss served. We conclude that no evidence for an automatic strengthening effect of reinforcers was found, while predictions from a theory of verbal control, when calculated directly from classifiable hypotheses only, account extremely well for the behavior of all Ss under conditions of partial reinforcement. The direct method thus amounts to the accounting suggested by Dulany and O'Connell for partially correlated rules, and the results of the present study thus support their basic position. However, we suggest that in situations where the probability of success of a hypothesis can be more directly controlled there may be greater possibilities for dissociation of hypotheses and behavior through reinforcement.

R 3

27,945

Denny, J.P. & Gamlin, P. MEMORY LOAD AND FORM OF INFORMATION INPUT AS DETERMINANTS OF PROFICIENCY IN CONCEPT FORMATION. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 93-94. University of Western Ontario, London, Ontario, Canada.

This study showed that poor proficiency in concept formation was associated primarily with deficiencies in the input of information to the S's concept-formation processes, rather than with deficiencies in the transformation of that information into conclusions about the concept. Deficiencies of information input of 2 kinds were investigated: a) the form of the input, optimized and nonoptimized; and b) the memory load imposed by the input, high load and no load. 4 different groups of Ss received the 4 possible combinations of optimized and non-optimized form of input with high and no memory load. It was predicted that the optimized-form-of-input and no-memory-load conditions would be associated with increased concept-formation proficiency, and that the majority of Ss in the optimized-no-memory group would make no errors in their conclusions about the concept. The results of this Exp. confirmed predictions that increases in concept-formation proficiency would result from presenting information to Ss in an optimized form and from reducing the memory load imposed by the information. The results also confirmed expectations that these 2 factors together would eliminate errors in concept formation for most Ss. The data were taken to support the position that concept-formation proficiency is more powerfully influenced by the quality of the input of information than by strategies used to transform the information into conclusions about the concept.

R 5

27,946

Davis, G.R. & Edwards, A.E. PHYSIOLOGICAL ADAPTATION TO STRESS: THE INFLUENCE OF MASSES AND SPACED PRACTICE. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965." July 1965, 157-158. US Veterans Administration Wadsworth Hospital, Los Angeles, Calif.

The task of this study is to attempt to shift the seemingly stable patterns which are found in autonomic variables when they react to a single stressor. Consequently, the primary dependent variable selected for this study is not the differential reactions to a stress (often referred to as lability scores), as such, or the level of physiological activation as stress is applied (often called autonomic tension scores), but a consistency score reflecting the stability of each individual's physiological pattern following repeated exposures to a stress. The stressor used in this study was hyperventilation, selected because it is: a) acute; b) both psychologically and physiologically stressing; c) infrequently experienced in everyday life; and d) easily applied with a minimum of 'startle' due to E intervention or manipulation, while its massing or spacing served as the experimental treatment. Specifically, it was hypothesized that repeated hyperventilations would produce adaptation of stress responses to differing degrees, or at differing rates for particular physiological dimensions. Consequently, massing or spacing of these stress experiences would have distorting effects upon individual autonomic response patterns. 24 Ss, free of physical and emotional illness requiring treatment, were used. The hypothesis that cumulative experience at hyperventilation would produce adaptation or attenuation of stress responsivity must be rejected. Further, the patterns of individual response stereotypy failed to undergo significant change and the major hypothesis, that massing or spacing of experience would distort these patterns, must be rejected.

R 7

27,947

Collins, R.L. DETECTING VARIABLE SIGNALS IN NOISE: A DILEMMA AND PROPOSAL. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965," July 1965, 167-168. Cleveland Psychiatric Institute, Cleveland, Ohio.

This paper describes 2 techniques: Photographic Elimination of Transients (PET), and Computer Analysis of Signal Dispersion for avoiding the 2 procedural errors which lead to incorrect identification of biological processes: type A error--failure to distinguish between signal and noise and type B--mistaken assumption of a steady-state neurophysiological model. PET is the simplest technique; moreover, signal definition is always a function of the magnitude of biological variation. Where variations are minimal, PET composites rival the definition of computer averages. Under conditions of greater variation, PET does not oversimplify the waveform. Path definition is always consistent with levels of biological variability, and reflects the modal waveshape in correct signal amplitude. PET never depicts a waveform which is spurious either in amplitude or shape.

R 4

27,948

Vaughan, H.G., Jr., Costa, L.D., Gilden, L. & Schimmel, H. IDENTIFICATION OF SENSORY AND MOTOR COMPONENTS OF CEREBRAL ACTIVITY IN SIMPLE REACTION-TIME TASKS. Report from: "Proceedings of the 73rd Annual Convention of the American Psychological Association, July 1965," July 1965, 179-180. Albert Einstein College of Medicine, Yeshiva University, New York, N.Y.

This report describes a simple RT Exp. in which a cortical potential associated with the motor response was obtained by subtracting the evoked response to stimulation without motor response from that recorded during RT performance. Differentiation of cortical activity elicited by peripheral stimulation from that related to motor response permitted definition of the afferent and efferent portions of the sensorimotor sequence, thus delimiting the delay attributable to cerebral processes.

R 4

27,949

USA Systems Analysis Division. A STUDY OF ARMY MANPOWER AND PERSONNEL MANAGEMENT. VOLUME I. May 1965, 214pp. USA Systems Analysis Div., Office of the Chief of Staff, Washington, D.C. (AD 475234)

The entire Army personnel system is examined--military and civilian, active Army and Reserve Components. Current policies, organization, practices and procedures are described and compared to a hypothetical manpower and personnel management system. Deficiencies are isolated and specific improvement actions recommended covering determination of requirements; procurement and career development; grade structure; manpower control; distribution; data base; and decision processes.

27,950

Underhill, D.B. LEAFLET PRINTING AND DISSEMINATION GUIDE. ca. 1965, 35pp. USA Broadcasting & Visual Activity, Pacific, Hqs., APO, San Francisco, Calif. (AD 472917)

This paper has been especially prepared to assist personnel engaged in leaflet preparation, printing and dissemination. It is published in this form as an interim paper pending the publication of a complete hand book on leaflet operations. It represents only a fraction of the data and experience available on the subject of leaflet dissemination. This paper is in the process of being translated into Vietnamese and will be published in the near future. The techniques and bundle device covered in this paper are well-suited for small targets such as villages and roads. The procedure outlined requires a minimum N leaflets, and is simple and inexpensive. The principles of leaflet drift and diffusion described herein are applicable to all aerial leaflet dissemination operations and have been developed to the point where it is possible to drop up to 10 tons of leaflets with 1 pass of an aircraft and cover either thousands of square miles or large point targets from 50 to 100 miles away.

27,951

Kitayev-Smyk, A. MAN IN A STATE OF WEIGHTLESSNESS. FTD TT 65 146/1+2, June 1965, 15pp. USAF Translation Div., Wright-Patterson AFB, Ohio. (Transl: Nauka i Zhizn (Russian), 1964, 9, 16-21).

The results of experiments performed during brief periods of weightlessness (parabolic flight trajectory) are summarized. The functioning of the vestibular apparatus is described. Differences in the sensations of persons experiencing weightlessness are categorized and related to one of the visual illusions--figure distortion. Increased color sensitivity is also noted. The disrupted relationship between vision and hand movement is illustrated in hand writing experiments. Finally, the effects of weightlessness on the performance of tasks was shown as contrary to introspective reports, i.e. the task required more time and there were more errors (everything is not "faster and easier" than under ordinary conditions).

27,952

Kenedi, R.M. (Ed.). BIOMECHANICS AND RELATED BIO-ENGINEERING TOPICS. Report from: "Proceedings of a Symposium, Glasgow, Scotland, September 1964." 1965, 493pp. Pergamon Press, Edinburgh, Scotland. (University of Strathclyde, Glasgow, Scotland).

The purpose of this symposium was to promote correlation between the contributions made by different disciplines in relation to the various problems studied. 164 participants attended, including representatives from Scandinavia, Germany, Holland, Italy and the United States. This volume contains the results of 7 working sessions at which a total of 34 papers contributed from Britain and overseas were presented and discussed. The papers covered the following topics: new developments in surgical and laboratory instrumentation; the diagnostic applications of ultrasound and telemetering techniques; the determination and clinical significance of the biochemical characteristics of skin, cartilage, blood and bone; the problem of the femoral neck fracture from its clinical and biochemical aspects; the characteristics of human locomotion and the design aspects of artificial limbs and applications of electrical analogue systems to lung function and psychosis.

R many



27,953

Alt, F., Harlow, W.G. & Metz, H.D. BIOMECHANICAL INSTRUMENTATION ENGINEERING. Report from: "Biomechanics and Related Bio-Engineering Topics." Chapter 1, 1965, 9-19. Pergamon Press, Edinburgh, Scotland. (National Institutes of Health, Washington, D.C.).

This paper describes the organizational, professional, and economic setting in which the biomechanical instrumentation engineer and the biomedical engineer in general, perform their technical role. The 4 groups: private commercial firms, research institutes, professional societies, and the U.S. government, active in this field, are considered in terms of their type of involvement. Several examples of biomechanical instrumentation developments are discussed: central dialyzer system for treatment of kidney failure, apparatus for experimental head injury research, and the automated microtome.

R 18

27,954

Jacobs, J.E. APPLICATIONS OF ULTRASOUND IMAGE CONVERTERS IN BIOLOGY. Report from: "Biomechanics and Related Bio-Engineering Topics." Chapter 5, 1965, 63-77. Pergamon Press, Edinburgh, Scotland. (Northwestern University, Evanston, Ill.).

In this paper the following topics are discussed: the pulse echo vs the image converter techniques for the use of ultrasound (advantages and disadvantages are detailed); types of electronic image conversion systems; specific details of the image converter system herein used; operational characteristics of this system, e.g., resolution capability; and applications--mainly studies associated with the cardiovascular system.

R 27

27,955

Noltingk, B.E. & Jones, D.H. TELEMETERING TECHNIQUES FOR MEDICAL APPLICATIONS. Report from: "Biomechanics and Related Bio-Engineering Topics." Chapter 6, 1965, 79-93. Pergamon Press, Edinburgh, Scotland. (Central Electricity Research Laboratories, Leatherhead, Surrey, England).

Optical, ionizing, and acoustic telemetry systems are considered briefly. Electrical systems are described in some detail under the topics: external and internal telemetry applications, methods of modulation suitable to medical telemetry, choice of frequency, power sources and their characteristics, telecontrol by magnetic fields, transducers, equipment reliability, material compatibility for implanted equipment, and the possibilities of further miniaturization of the electronic equipment.

R 33

27,956

Lissner, H.R. THE RESPONSE OF THE HUMAN BODY TO IMPACT. Report from: "Biomechanics and Related Bio-Engineering Topics." Chapter 11, 1965, 135-139. Pergamon Press, Edinburgh, Scotland. (Biomechanics Research Centre, Wayne State University, Detroit, Mich.).

This paper is concerned mainly with describing research techniques that are being employed in injury-producing impact research. First, significant parameters of the impact itself are considered: region of body affected; location, direction, and energy of the blow; velocity of the impact; mass, shape, form and hardness of the striker. The techniques described and illustrated include: determining the behavior of the spine when subjected to longitudinal impact through the seat (as produced by use of aircraft ejection seat) using a cadaver with strain gages cemented directly to the individual vertebra and accelerometers mounted on the iliac crest, sternum, and top of skull (the findings are compared with test results on living dogs); determining the concussive effect of a blow by the head to auto glass using a cadaver with the skull modified with gelatin and pressure gages inserted and an accelerometer mounted in contact with the bone at the back of the head; concussion testing using various experimental animals to determine whether species plays a significant role.

27,957

Contini, R., Gage, H. & Drillis, R. HUMAN GAIT CHARACTERISTICS. Report from: "Biomechanics and Related Bio-Engineering Topics." Chapter 34, 1965, 413-431. Pergamon Press, Edinburgh, Scotland. (New York University School of Engineering & Science, New York, N.Y.).

Walking, as the most common method of human locomotion, is analyzed. Characteristic patterns of walking are described. Conventional methods for describing gait in objective terms are discussed and illustrated. These include electrical and optical techniques for obtaining the temporal, kinematic and kinetic measures. The instrumentation used by the New York University Biomechanics Group is described--"Elgons", linear and angular accelerometers and the circuitry associated with these. Analytic methods, vector and harmonic analysis, for the interpretation of the recorded data are presented. The more significant differences between normal and pathological gait are discussed. The application of these techniques to the evaluation of the more complex prosthetic devices are described and other possible applications are also reviewed.

R 35

27,958

McKenzie, D.S. KNEE CONTROLS FOR ARTIFICIAL LEGS. Report from: "Biomechanics and Related Bio-Engineering Topics." Chapter 35, 1965, 433-441. Pergamon Press, Edinburgh, Scotland. (Queen Mary's Hospital, Tothampton, London, England).

The normal gait cycle is described as necessary background for understanding the design requirements of a prosthesis for a missing leg. The main phases of the cycle, stance and swing, are then considered in detail as to their performance and normality requirements. Existing devices and systems are evaluated relative to these considerations.

R 11

27,959

Kinnier Wilson, A.B. MOVEMENT AND CONTROL IN EXTERNALLY POWERED PROSTHESES AND SPLINTS. Report from: "Biomechanics and Related Bio-Engineering Topics," Chapter 36, 1965, 443-453. Pergamon Press, Edinburgh, Scotland. (West Hendon Hospital, London, England).

This paper is concerned with the continuing developments and progress in externally powered prosthesis systems, specifically in the areas of the powered movements needed and the control of them by some other part of the body. The problems involved in deciding upon those movements or muscles to control the appliance are discussed. The characteristics and performance of pneumatic control systems, the current technique, are described.

R 4

27,961

Frederiksen, J.R. THE ROLE OF COGNITIVE FACTORS IN THE RECOGNITION OF AMBIGUOUS VISUAL STIMULI. Contract Nonr 1858 (15), Proj. NR 150 088, NSF Grant G 22889, Res. Bull. 65 23, July 1965, 51pp. Educational Testing Service, Princeton, N.J. (AD 473580)

The effect of 5 cognitive abilities on the recognition of out-of-focus pictures was investigated. In addition to recognition point measures, the Ss received scores reflecting their rate of hypothesis formation during the early stages of blur. The results indicated that the pictures did not all require the same cognitive abilities for their recognition. Nevertheless, some general effects of the cognitive abilities on slide recognition, which were independent of the particular picture, were also noticed. It was found that the ability to visualize was negatively associated with early slide recognition, while speed of closure was positively related to early recognition. It was also observed that visualizers tended to make fewer guesses about the blurred pictures than did nonvisualizers, while people who were high in speed of closure produced many initial hypotheses than for Ss who had few initial ideas. The results were summarized in a post hoc computer simulation type of model.

R 18

27,962

Edmundson, H.P. MATHEMATICAL MODELS OF SYNONYMY. Report from: "1965 International Conference on Computational Linguistics, 19-21 May 1965, Park-Sheraton Hotel, New York City, N.Y.", Grant AF AFOSR 612 64, AFOSR 65 1387, ca. 1965, 17pp. University of California, Los Angeles, Calif. & System Development Corporation, Santa Monica, Calif. (AD 621160)

A historical summary is made of the concepts of synonymy and antonymy. The roles of part-of-speech and context of a word are considered. The concept of a synonym of a word is shown to require the use of a ternary relation rather than that of a binary relation. Synonymy is defined implicitly, rather than explicitly, by 3 axioms that lead to equivalence relations that partition the set of content words of a language into equivalence classes. Antonymy is defined implicitly by another set of 3 axioms. Several algebraic, geometrical, and topological models of synonymy and antonymy are posed and examined.

R 9

27,963

Dobbins, D.A., Gast, M. & Kindick, C.M. JUNGLE VISION IV: AN EXPLORATORY STUDY ON THE USE OF YELLOW LENSES TO AID PERSONNEL DETECTION IN AN EVERGREEN RAINFOREST. DA Proj. 1L013001A91A, Res. Rep. 4, July 1965, 29pp. USA Tropic Test Center, Fort Clayton, Canal Zone, Panama. (AD 622336)

The purpose of this study was to explore the use of nonmagnifying yellow lenses to enhance personnel detection in the evergreen rainforest. 12 Infantry observers with normal vision, using spectacles fitted with yellow lenses, were each presented 45 randomly appearing human targets within a 180° field of search. The targets, who were dressed in standard Army field clothes, stood motionless at predetermined distance markers facing the observer. Tests were conducted on 3 sites in the evergreen rainforest of the Canal Zone during the dry season (April 1965). Results were compared with those obtained from 18 additional observers with unaided vision, who were tested on the same sites and under the same conditions. The major effect of using the yellow lenses was to restrict rather than increase detectability of human targets. Perceptually, the lenses made the targets appear farther from the observers, resulting in significant distance overestimation. Detection times and practice effects were not affected by the use of the lenses.

R 3

27,964

Demaree, R.G., Norman, D.A. & Matheny, W.G. AN EXPERIMENTAL PROGRAM FOR RELATING TRANSFER OF TRAINING TO PILOT PERFORMANCE AND DEGREE OF SIMULATION. FINAL REPORT JUNE 1963-JULY 1964. Contract N61339 1388, Proj. 7619 1, Tech. Rep. NAVTRADEVGEN 1388 1, June 1965, 66pp. USN Training Device Center, Port Washington, N.Y. (Life Sciences, Inc., Fort Worth, Tex.). (AD 471806)

The Universal Digital Operational Flight Trainer Tool (UDOFFTT), programmed to simulate a high-performance, single-engine jet fighter, was used for an initial pilot performance study. 6 maneuvers were employed in conjunction with real-time simulation of in-flight piloting tasks in an F-100A cockpit. The results of this study and of earlier investigations of the UDOFTT provided a basis for planning a series of pilot training experiments. The methodology, rationale, and design of these experiments were oriented toward effective use of the UDOFTT to establish the extent to which reductions in the degree of simulation affects pilot performance and the amount of transfer of training.

R 21

27,965

Coles, R.R.A. & Rice, C.G. THE PURE-TONE, SPEECH AND IMPULSE-NOISE ATTENUATING PROPERTIES OF SELECTONE-K AND V51R EAR PLUGS. RNP 65/1049, He.S. 80, March 1965, 34pp. Royal Naval Personnel Research Committee, MRC, London, England. (Royal Navy Medical School, Alverstoke, Hants, England & University of Southampton, Southampton, England). (AD 473694)

The pure-tone and speech attenuation characteristics of Selectone-K and V51R ear plugs have been measured by a monaural earphone threshold shift technique. The finding, that Selectone-K plugs have a slight advantage for speech communication, was confirmed later by field trials. Temporary threshold shift reduction experiments showed that Selectone-K plugs were not quite so efficient for protection against impulsive noise, especially where the latter occurs in a reverberant enclosure. It is concluded that, after further developments, a plug with low-pass filter characteristics could offer distinct advantages for ear protection in intermittent impulsive noise conditions. Recommendations are made with regard to the best course of further research, and on improvements which are needed in range design and practice and in ear plug sizes. The report is supported by 5 appendices. These include an account of measurement of the physical characteristics of the impulsive noise sources employed and of the effect of ear plugs on speech discrimination in persons with a pre-existing hearing loss.

R 22

27,966

Bell, C.F. INFORMATION NEEDS FOR EFFECTIVE MAINTENANCE MANAGEMENT. Report from: "DOD Logistics Research Conference, Panel No. 5: Maintenance and Repair Concepts, Warrenton, Virginia, 26-28 May 1965." Aug. 1965, 12pp. Rand Corporation, Santa Monica, Calif. (AD 619702)

The purpose of this paper is to review research in the areas of maintenance management information systems and maintenance organizations. As well, it is to discuss information needs for effective maintenance management, which includes: evaluating maintenance requirements, optimizing maintenance capabilities, and increasing materiel readiness. A substantial majority of the studies reviewed were concerned with maintenance and repair concepts: optimum maintenance cycles, workload measurement, automatic inspection and diagnostic systems; with maintainability and reliability specifications, etc.

R 6

27,967

Inaba, K., Behan, R.A., Spencer, V.H., et al. PRESENTATION OF INFORMATION FOR MAINTENANCE & OPERATION (PIMO) ON UH-1F. FINAL SUMMARY REPORT. Contract AF 04(694)729, BSD TR 65 458, Rep. 64 P 6, Sept. 1965, 400pp. USAF Ballistics Systems Div., Norton AFB, Calif. (Serenidipity Associates, Chatsworth, Calif.). (AD 473920)

The report presents the results of a 6 months program to study and develop a concept for the presentation of information for maintenance and operation (PIMO) on the UH-1F. The report summarizes the results presented in the previous 3 status reports as well as details on analysis/design activities completed during the final reporting period. Results of the study indicate that: a) system effectiveness can be increased significantly by reasonable reductions of personnel performance time and errors; b) an audio-visual approach shows considerable promise in reducing performance time and error; c) improvements are also possible with an all visual or print approach, but not as promising as the audio-visual; d) little is known on the extent to which presentation principles apply in situations other than a stationary performance situation; e) modified versions of existing equipment can be used to test the relative effectiveness of an audio-visual and an all visual (print) approach; and f) the same study should be used to collect data which will allow qualifications of the presentation principles in terms of how they should be applied to various maintenance situations.

R 42

27,968

Teller, Davida Y. THE INFLUENCE OF BORDERS ON INCREMENT THRESHOLDS. Contract DA 49 193 MD 2713, PLR 17A, Ca. 1965, 7pp. University of Washington, Seattle, Wash.

An attempt was made to determine empirically the actual cause or causes of the elevated thresholds on the high intensity side of a border. These elevated thresholds are tentatively attributed to the combined influence of 2 factors: involuntary eye movements, which produce frequent changes of retinal illuminance near the border; and transient elevations in the increment threshold which occur near the times of large, rapid changes in retinal illuminance. It is concluded that short-term lateral interactions have little if any influence on increment thresholds on the high intensity side of a border. The possibility remains, however, that such increment thresholds may be influenced by lateral interactions whose effects take an extended period of time to develop.

R 7

27,969

Schumann, J.R. CNU-1/P SUSTENANCE KIT MODIFICATION (T - 33). Proj. 8238, Task 823802, AAL TR 65 22, Nov. 1965, 24pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (AD 629347)

At the request of the Alaskan Air Command, this project was established to provide adequate cold-weather survival protection for T-33 pilots who utilize the seat-pack parachute. Pilots in this category had not previously been so equipped. After extensive evaluation and operational testing, the Alaskan Air Command approved modification of CNU-1/P for use with the seat-pack parachute in the T-33 jet aircraft. The kit is now in use during the period October through May. In addition to basic survival items, the kit contains a down-filled coat, SRU-6P; mittens, SRU-10P; and half bag or foot sack SRU-12P. The problem of bulk reduction was solved by tufting, using manual pressure and upholstering methods. Packaging of the down-filled clothing into the CNU-1/P kit can be done by local Personal Equipment Technicians with a small expenditure of man-hours and materials.

27,970

Rogers, T.A., Setliff, J.A. & Buck, A.C. AMELIORATIVE MEASURES IN FASTING, SUBARCTIC SURVIVAL SITUATIONS. Contract AF 41(609) 1918, Proj. 8238, Task 823803, AAL TR 65 10, Nov. 1965, 16pp. USAF Arctic Aeromedical Lab., Fort Wainwright, Alaska. (Pacific Biomedical Research Center, University of Hawaii, Honolulu, Hawaii). (AD 628897)

The experiment described in this report was undertaken to explore practicable measures that might minimize dehydration and other metabolic derangements in a fasting, arctic survival situation. 28 men, divided into 4 groups, were fed a standard diet of USAF IF#10 rations in barracks for 2 days, then subjected to a 3-day simulated survival situation, followed by 2 days of standard diet in barracks. Group A received no supplements, Group B received an electrolyte supplement administered as 150 mEq NaCl the first day and 150 mEq NaHCO<sub>3</sub> the next 2 days, Group C 500 kcal as sucrose, and Group D 500 kcal as sucrose plus electrolyte as in B. Results suggest that a survival ration could, with benefit, comprise 500 kcal/day of carbohydrate supplemented with a sodium salt, as this combination ameliorates dehydration, hypoglycemia and ketonuria ordinarily associated with a survival situation. Provision of sodium as bicarbonate did not appear to be of any advantage.

R 5

27,971

USAF Aerospace Medical Research Laboratories. PROCEEDINGS OF THE CONFERENCE ON ATMOSPHERIC CONTAMINATION IN CONFINED SPACES 30 MARCH-1 APRIL 1965. Contract AF 33(657) 11305, Proj. 6302, AMRL TR 65 230, Dec. 1965, 317pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (AD 629622)

This report is a complete compilation of the papers presented and the proceedings of the Conference on Atmospheric Contamination in Confined Spaces, sponsored by the Aerospace Medical Research Laboratories and held in Dayton, Ohio on 30, 31 March and 1 April 1965. Major technical areas discussed by the invited speakers, panel members and Conference attendees included continuous inhalation exposure techniques, statistical methods for evaluation and interpretation of exposure data, minimum criteria for continuous exposure studies and toxicological qualification of space cabin materials. The Conference participants were provided the opportunity to tour the Toxic Hazards Research Unit at Wright-Patterson Air Force Base and to ask questions regarding its operation. A discussion of the Clean Air Act of 1963 was presented by a representative of the Federal Department of Health, Education and Welfare.

R 114

27,972

Owen, J. THE CONSISTENCY OF A NON-PARAMETRIC DECISION PROCEDURE. Contract Nonr 4752(00), Proj. NR 348 010, Rep. 100:6, Tech. Note 3, Sept. 1965, 15pp. Information Research Associates, Inc., Cambridge, Mass.

It has been suggested that if a discriminating procedure is to adapt to an environment, it must not be limited by erroneous assumptions concerning the unknown distributions or functional form for the discriminator. This technical note displays mathematically the analogy between the notion of learning and the concept of consistency originally defined for parameter estimation. Moreover, some information concerning limiting behavior is deduced.

R 3

27,973

Kelley, C.R., Ketchel, J.M. & Strudwick, P.H. EXPERIMENTAL EVALUATION OF HEAD-UP DISPLAY HIGH BRIGHTNESS REQUIREMENTS. Contract AF33(675)8260, Tech. Rep. HFR 9765 1, Nov. 1965, 26pp. Kaiser Aerospace & Electronics, Palo Alto, Calif. (AD 626657)

The HUD, or Head-up part of Kaiser's Vertical/Head-up Display, is an avionics device that collimates and projects symbology onto the real world at infinity. It enables a pilot to look through the aircraft windscreen while viewing command and status information without requiring visual accommodation changes. This experiment was undertaken to determine what symbol brightness is required to use the Head-up Display under high background brightness conditions. The anticipated worst situation (other than looking directly into the sun) consists of flight over sunlit clouds or snow, in which case there could be continuing background brightnesses on the order of 10,000 ft-L against which the display must be seen. Results indicate that pilots will want display contrasts of at least 20 to 35%, i.e., perhaps 1800 to 3500 ft-L display brightness reflecting from the HUD combining glass, assuming 90% transmission by windscreen and combining glass and an external background luminance of 10,000 ft-L. The minimum brightness contrast for a barely visible, near-threshold display is on the order of 10%, or 900 to 1000 ft-L reflected from the combiner. This will provide an extremely dim display, but one that most pilots can be expected to see more than 90% of the time.

R 10

27,974

Hill, J.H. & Chisum, Gloria T. FLASHBLINDNESS: THE EFFECTS OF PREFLASH ADAPTATION AND PUPIL SIZE. Proj. WepTask RAE 13J 012/2021/R005 01 01, Prob. Assign. JO4AE23 1, NADC ML 6508, June 1965, 14pp. USN Aviation Medical Acceleration Lab., NADC, Johnsville, Penn. (AD 629589)

A question of considerable operational importance is the extent to which the blinding effect of a flash from a nuclear weapon will vary with the ambient light level. Under conditions of darkness, the size of the pupil and the sensitivity of the eye are maximized. With an increase in the ambient light level both the sensitivity of the eye and the pupil size decrease. Data are presented on the independent effects of pupil size and receptor adaptation level on the production of flashblindness by high intensity, short-duration flashes.

R 7

27,975

Freeman, F.R., Agnew, H.W., Jr. & Williams, R.L. AN ELECTROENCEPHALOGRAPHIC STUDY OF THE EFFECTS OF MEPROBAMATE ON HUMAN SLEEP. Clin. Pharmacol. Therapeutics, March-April 1965, 6(2), 172-176. (Psychiatry Dept., University of Florida College of Medicine, Gainesville, Fla.). (AD 629563)

The effect of meprobamate on human sleep and dreaming was assessed in a double-blind, placebo-controlled study by means of all-night electroencephalography. On nights when meprobamate was ingested in a dose of 400 mg. at 9:00 P.M. and 800 mg. at 12:00 A.M., normal Ss spent significantly less time in sleep accompanied by low-voltage fast EEG waves and more time in sleep manifested by spindling in the EEG than when receiving placebo. The time spent in rapid eye movement periods, which are related to visual dreaming, was decreased by meprobamate. This study shows that meprobamate characteristically alters the amount of time spent in each sleep stage and significantly decreases inferred visual dreaming. Comparisons are made between the changes in the human electroencephalogram during sleep produced by meprobamate and those produced by the barbiturates.

R 14

27,976

Catalano, J.F. & Katz, M.S. DETECTION IN A HOMOGENEOUS VISUAL FIELD UNDER A CONDITION OF INFINITE DEPTH OF FOCUS. Proj. 7885 8, Tech. Rep. NAVTRADEVEN IH 33, Aug. 1965, 15pp. USN Training Device Center, Port Washington, N.Y. (Amer. J. Psychol., Dec. 1965, 78(4), 634-639). (AD 624531)

It has been proposed by Whiteside that in a homogeneous visual environment involuntary accommodation results in a myopic condition which impairs target detection. A means of overcoming this myopia by approximating a condition of infinite depth of focus with the use of an artificial pupil was studied. No improvement of target detection resulted from this procedure.

R 6

27,977

Cofer, C.N. SOME OBSERVATIONS ON THE USE OF FREE WORD ASSOCIATIONS IN THE SELECTION OF WORDS IN THE CONSTRUCTION OF SENTENCES. Contract Nonr 656(30), Proj. NR 154 161, Tech. Rep. 9, Aug. 1965, 10pp. Psychology Dept., Pennsylvania State University, University Park, Penn.

30 3-word sets were developed, and Ss were asked to write sentences containing 1 designated word of the 3 words and 1 of the 2 remaining words. It had been expected that associative relations among the words would systematically determine which choice word would be used. The evidence obtained did not support this expectation. A number of limitations in the method and materials employed are indicated as factors reducing the conclusiveness of this study and as problems to be met in further research.

R 5

27,978

Cofer, C.N. SOME DATA ON CONTROLLED ASSOCIATION. Contract Nonr 656(30), Proj. NR 154 161, Tech. Rep. 10, Oct. 1965, 10pp. Psychology Dept., Pennsylvania State University, University Park, Penn. (AD 628851)

Data from 4 controlled association (CA) conditions were obtained and compared with free association (FA) response distributions for the same stimuli. It was found that over half the CA responses also occur in FA, though at different frequencies, and that a high proportion of the response frequencies in both CA and FA are accounted for by responses common to both. A wider variety of responses occurred under CA than under FA. From 1 to 2 of the 3 most frequent responses in CA and FA were, on the average, identical. The FA responses which also occur in CA have higher FA frequencies than those which do not appear in CA. Frequencies of the primary, secondary, and tertiary responses in CA and FA show some differences, mainly with respect to the primary. Responses inappropriate to CA instructions occur in CA and the frequency of such responses is associated with their FA frequencies. FA distributions for several stimuli used across CA conditions could be partially synthesized from the CA distributions. It is concluded that, under the conditions of this study, there is substantial similarity in the responses obtained under CA and FA. Conditions which are involved in this result are summarized and contrasted with conditions in which CA responses differ markedly from those obtained in FA.

R 14

27,979

Choliasmenos, C.J., Sundararajan, V., Teague, W.F. & Tiedemann, J.B. GEM RESEARCH AT THE UNIVERSITY OF KANSAS, OCTOBER 1963-DECEMBER 1965. Contract Nonr 4201(00), Tech. Rep. 1, Dec. 1965, 98pp. Research Center, University of Kansas, Lawrence, Kan. (AD 629725)

Flight experience with GEM III has revealed potential difficulty in handling a ground effect machine over land surfaces, but control may be simplified by special piloting techniques or by use of a drift stabilizer. Optimum turns of a GEM in restricted quarters are analyzed. Experiments with several types of flexible understructures are described, and a pressure survey of the cushion area of GEM III has been conducted. A simple flight simulator for ground effect machines has been constructed.

R 6

27,980

Baker, L.E. (Chm.). REPORT OF THE ELEVENTH ANNUAL ARMY HUMAN FACTORS RESEARCH AND DEVELOPMENT CONFERENCE. JOHN F. KENNEDY CENTER FOR SPECIAL WARFARE, FORT BRAGG, NORTH CAROLINA, 3-6 OCTOBER, 1965. Oct. 1965, 362pp. USA Office of the Chief of Research & Development, Washington, D.C.

The papers presented at the conference are grouped into chapters having the following titles: stability missions; maintenance of security; special factors in stability operations; Gabriel demonstration (psychological warfare research in Malaya); research in selecting and training personnel for stability operations; and research in human engineering (including study of rifle firing, smoke marker detection and identification, and night operations). (HEIAS)

R many scattered

27,981

Bartley, S.H. FATIGUE, MECHANISM AND MANAGEMENT. 1965, 96pp. Charles C. Thomas, Springfield, Mass. (Michigan State University, East Lansing, Mich.).

This volume contains material on the definition of fatigue, fatigue situations, forms of inadequacy contributing to fatigue, the mechanisms underlying fatigue, the chemistry of fatigue, agents relieving fatigue, and the management of fatigue. (HEIAS)

R 63

27,982

US Aerospace Technology Division. GLOSSARY OF CHICOM TELECOMMUNICATIONS TERMS. SURVEYS OF CHINESE COMMUNIST SCIENTIFIC AND TECHNICAL LITERATURE. ATD Rep. P 65 59, July 1965, 88pp. US Aerospace Technology Div., Library of Congress, Washington, D.C.

By surveying the Chinese Communist scientific and technical literature it was possible to construct a glossary of telecommunications terms which constitutes the bulk of this document. (HEIAS)

R 10

27,983

Wilkerson, L.E., Norman, D.A., Matheny, W.G., Demaree, R.G., et al. PILOT PERFORMANCE, TRANSFER OF TRAINING AND DEGREE OF SIMULATION: I. VARIATIONS IN PROGRAM CYCLE TIME AND AERODYNAMIC EQUATIONS. Contract N61339 1388, Proj. 7619 1, Tech. Rep. NAVTRADEVEN 1388 2, Dec. 1965, 59pp. USN Training Device Center, Orlando, Fla. (Life Sciences, Incorporated, Fort Worth, Tex.).

This is the second report in a study program dealing with pilot performance, transfer of training and degree of simulation. In the experiments reported, currently qualified jet fighter pilots flew specified maneuvers using the Universal Digital Operational Flight Trainer Tool under variations of program cycle time and of aerodynamic equations. Neither increased program cycle time nor simplified equations as they were defined herein had an adverse effect on pilot performance. Furthermore, it was demonstrated that pilots could be trained on these same restricted simulator conditions and then effectively transferred to more realistic simulator conditions without any significant decrement in performance.

R 12

27,984

Wherry, R.J., Jr. & Hutchins, C.W., Jr. THE USE OF PROCUREMENT SOURCE AS A PREDICTOR OF SUCCESS IN TRAINING. Spec. Rep. 65 5, July 1965, 14pp. USN School of Aviation Medicine, NAMC, Pensacola, Fla. (AD 620017)

The procurement sources of 726 officer and 1346 nonofficer flight students were made into a series of dichotomous variables according to the pseudovariation technique of Wherry, Jr. These variables were then included in the computation of the multiple prediction formulae used to predict success in the flight training program. The inclusion of these dichotomized procurement source variables resulted in significant increases in the multiple validity in almost every case for both officers and nonofficers and for the 3 criteria investigated.

R 2

27,985

USA Advanced Research Projects Agency. LETTER REPORT FOR EVALUATION - RANGER PACK. JRATA Proj. 2K 456.0, June 1965, 13pp. USA Advanced Research Projects Agency, APO, San Francisco, Calif. (AD 466148)

The purpose of this project was to develop a pack which was anthropometrically designed for the physical stature of Vietnamese rangers. The load-carrying equipment is described in this report. Prototype packs were field evaluated. The system was found to be of sufficient capacity to enable the ranger units to carry sufficient food and personal items to sustain operations for periods of 7 to 10 days, but the material should be made water resistant. (HEIAS)

27,986

Rundquist, E.A., Ford, J.D., Chesler, D.J., Rohwer, W.D., Jr., et al. PREPARATION FOR PROBLEM SOLVING: STRUCTURAL VS. STRATEGY PRETRAINING. FINAL REPORT. Proj. PF0170320210, Tech. Bull. STB 66 1, July 1965, 57pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 619705)

In an attempt to answer questions regarding performance improvement in complex applied problems, an experiment was designed to examine the effects of pretraining on the efficiency of concept attainment. 2 principal varieties of pretraining were provided to groups of college students whose subsequent performance on 5 criterion tasks was compared with that of Ss who received no pretraining. The Ss were taught either to analyze problem materials into their structural components or to apply a strategy for the solution of concept attainment problems. In either case, the training was relatively extensive, consuming 10 1-hour sessions for each of more than 20 problems each, 1 concept identification task and a fifth task that required the attainment of sequential or temporal concepts. The dependent measures of principal interest revealed slight, reliable, but insubstantial increments in the performance of Ss given strategy pretraining but not for those given structure pretraining. The most powerful effect of strategy training was to increase dramatically the tendency of Ss to withhold hypotheses until sufficient information had been acquired to insure accuracy. The discrepancy between these results and those reported previously is considered and the utility of laboratory concept attainment tasks for applied research is questioned.

R 11

27,987

Emery, J.H. & Koch, C.A. CONTACT ANALOG SIMULATOR EVALUATIONS: NUMERIC AUGMENTATION OF GRID PLANE ENCODEMENT. Contract Nonr 4429(00), JANAIR Tech. Rep. D228 420 007, Dec. 1965, 31pp. Bell Helicopter Company, Bell Aerospace Corporation, Fort Worth, Tex. (AD 633107)

Measurement was made of the ability of a group of helicopter pilots to perform simulated rotary wing maneuvers under 3 instrument display conditions which augmented the JANAIR contact analog vertical display with numeric information. Moving tape scales, moving pointer scales and digital readouts, each presented with the basic grid plane were compared with each other and the basic grid plane alone. The numeric information displayed included indices of altitude, heading and airspeed. The display conditions were tested under: a) a relatively stable cruise task; and b) a variable terrain following task. Measures of altitude control, airspeed control, heading control and appropriate collective control inputs were recorded. Results indicate that numeric information significantly enhanced performance when presented in conjunction with the contact analog and that the moving tapes and the moving pointers each produced significantly better scores than the digital readouts. These results were consistent in both helicopter tasks tested.

R 6

27,988

Mohler, S.R. FATIGUE IN AVIATION ACTIVITIES. CARI Rep. AM 65 13, March 1965, 15pp. Civil Aeromedical Research Institute, FAA, Oklahoma City, Okla. (AD 620022)

This report gives a comprehensive survey of work in the field of aviation fatigue. Both current work still in process and earlier work are surveyed. The nature of fatigue itself is discussed, along with all possible factors that contribute to both physical and mental fatigue. Topics covered include flight-time limitations, indicators of excessive fatigue, new developments related to intercontinental flights and Forest Service flights, and the author's detailed comments and recommendations.

R 105

27,989

Kashyap, R.L. PATTERN CLASSIFICATION AND SWITCHING THEORY. Contract Nonr 1866(16), Proj. NR 372 012, CL Tech. Rep. 483, Aug. 1965, 180pp. Cruft Lab., Harvard University, Cambridge, Mass.

This report is concerned with certain aspects of pattern classification and their relation to switching theory. Attention is focussed on pattern classification problems involving 2 classes. A pattern classification problem consists of 3 fundamental aspects, namely characterization or the choice of the independent variables of the problem, the so-called primary attributes, the abstraction or the determination of a decision surface based on a certain number of given samples of either class, and generalization or the ability of the decision surface to classify correctly a sample whose class is unknown.

R 43

27,990

Rauterkus, L.T., Feltz, J.F. & Fickes, J.W. FREQUENCY ANALYSIS OF KOROTKOV BLOOD PRESSURE SOUNDS USING THE FOURIER TRANSFORM. FINAL REPORT. Contract AF41(609) 2753, Sept. 1965, 53pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Systems Research Laboratories, Inc., Dayton, Ohio). (AD 473789)

The purpose of this investigation was to determine the f content of the sound signals (Korotkov sounds) obtained from the microphone located in the arm cuff of an automatic blood pressure measuring instrument. Korotkov sound recordings were made for 5 Ss in 5 experiment situations: rest, post-exercise, passive tilting, centrifuge rides, and flights in NF-100 aircraft. The f analysis was performed by using a digital computer to obtain the Fourier transforms of the sound signals. The Fourier transforms were displayed on the computer oscilloscope and photographed. These photographs were then arranged in a N rectangular arrays for convenient comparison of the f content of the Korotkov sounds as related to the several types of Korotkov sounds, the several experiment situations, and the several subjects. Initial study of 240 average Fourier transforms contained in these arrays indicates no readily observable common characteristics except that the majority of the sound energy is almost always located below 50 cps.

R 12

27,991

Keller, T., O'Hagan, J. & Weston, R. A STUDY OF THE MECHANICS OF HUMAN BALANCING FOR POTENTIAL APPLICATION TO THE CONTROL OF VEHICLES. PART I. INITIAL INVESTIGATION OF VERTICAL BALANCING IN EARTH GRAVITY. Res. Memo. 299, Oct. 1965, 21pp. Research Dept., Grumman Aircraft Engineering Corporation, Bethpage, N.Y. (AD 473504)

This is a report of progress in a continuing program of basic research into the mechanics of human balancing viewed as a closed loop dynamic process. The program is being conducted in conjunction with a NASA sponsored study of vehicular control using the human balancing reflex. Its ultimate objective is a general mathematical model of the balancing process. Initial work has been concerned with natural, fore-and-aft balancing on a simulated force-vector supported platform under conditions of earth gravity. Several kinds of experimentation and analysis procedures have been tried and a N hypotheses concerning such items as the relative roles of vision and proprioception in the balancing process, the effect of body flexibility, and the response to disturbing inputs have been qualitatively tested, but only a small amount of data suitable for mathematical analysis has so far been collected. The following, tentative conclusions about the balancing process have been drawn: a) it is completely subconscious and varies little between people; b) it is not significantly affected by body flexibility; c) it has a short period and a long period component, essentially uncoupled and operating through different sensing mechanisms; and d) its short period response is essentially a simple, damped sine wave.

R 1

27,992

Gonshor, H. & Parker, C.E. ALLOCATION OF VEHICLES AT CENTERS. Proj. Y F015 15 06 517, Tech. Note N 765, Sept. 1965, 10pp. USN Civil Engineering Lab., Port Hueneme, Calif. (AD 621154)

This technical note develops a model for the problem of allocating vehicles to centers where the total number of vehicles available is fixed. An algorithm for obtaining the optimal allocation is illustrated by means of an example. This model assumes the demand distribution for vehicles is known and that a penalty for lack of a vehicle at each center can be postulated. In Appendix A the total number is permitted to vary. A FORTRAN program to solve this problem on the IBM 1620 has been written and verified, and is listed in Appendix B.

27,993

Weinberg, L.W.T. & Turnbow, J.W. SURVIVABILITY SEAT DESIGN DYNAMIC TEST PROGRAM. FINAL REPORT. Contract DA 44 177 AMC 191(T), Subtask 1P121401A1500301, USAAVLABS Tech. Rep. 65 43, July 1965, 113pp. USA Aviation Materiel Labs., Fort Eustis, Va. (Aviation Safety Engineering & Research Div., Flight Safety Foundation, Phoenix, Ariz.). (AD 621718)

This report presents the results of a series of dynamic tests conducted with 4 different concepts of experimental crew seats. The experimental seats were designed and constructed by 4 helicopter manufacturers. The seats were designed to withstand static load factors equivalent to those recommended in TRECOM Technical Report 63-4, "Crew Seat Design Criteria for Army Aircraft", dated February 1963. The design load factors recommended in the above referenced report were as follows: longitudinal-45G for 0.10 sec; lateral-45G for 0.10 sec; and vertical-25G for 0.10 sec. Special kits for small arms ballistics protection were also designed and installed in the seats tested. These seats were designed exclusively using static load factors. No previous testing was conducted by any seat manufacturer prior to the conduct of these tests. The 4 seats were tested under 4 load conditions. 2 of the conditions involved simultaneous half loads on the seats in 2 different seat positions. Only 1 of the 4 seats tested withstood the loads imposed for all 4 conditions. 3 of the seats failed and were damaged beyond economical repair when each was subjected to the first full load test condition. This report also includes a detailed description of an acceleration device which was specially designed and fabricated for this series of tests.

27,994

McDavid, J.W. (Princ. Investigator). MOTIVATIONAL AND INCENTIVE FACTORS IN SOCIALLY INFLUENCED BEHAVIOR. FOURTH ANNUAL REPORT. Contract Nonr 4008(08), Task NR 177 303, Oct. 1965, 5pp. Psychology Dept., University of Miami, Coral Gables, Fla. (AD 621989)

The research to which this contract (Nonr-4008(08)) is addressed is concerned with clarification of empirical and theoretical distinctions between 2 kinds of conforming behavior (a normative or agreement-seeking process and an informational or knowledge-seeking process), as well as to exploration of the situational determinants of each. During 1965, several mutually related studies of conforming behavior have been completed. This series of related studies has investigated conformity on a paper-and-pencil judgement task, under the influence of announced group norms for agreement or disagreement with individual items. The variables investigated include: a) interactive effects of motivational arousal, attraction to the source of influence, and respect for the source of influence upon conformity; b) interactive effects of task difficulty and motivational arousal upon conforming behavior, and; c) residual effects (i.e., "learning") following social influences to conform. These studies will be reported in detail upon completion of the current program of investigation.

R 2

27,995

Whitehill, C.F., Mullikin, H.F. & Kubal, O.A. VENTILATION OF FALLOUT SHELTERS BY INDUCED DRAFT. Contract OCD PS 64 211, Work Unit 1231D, June 1965, 141pp. Mechanical Engineering Dept., Montana State University, Bozeman, Mont. (AD 621998)

Occupants of family-type fallout shelters require fresh ventilation air at the minimum survival rate of 3 cfm per person. Because cost limitations exclude the use of auxiliary power plants (diesel or gasoline engines) to operate ventilating fans or blowers, an inexpensive, simple, and effective method of supplying fresh air to home shelters is needed. It is demonstrated that a minimum air rate can be obtained in home shelters by inducing draft in the exhaust stack by means of a flame from a kerosene burner which can simultaneously provide illumination. The ventilation test procedure included inducing air to flow through the shelter, determining the actual cubic feet per minute of air flowing, measuring air temperatures at inlet, room, and stack, measuring the pressure drop or restriction to air flow at the shelter inlet, and finding the effects of various stack sizes and configurations upon air flow rates. Data were also taken to determine the effect of various stack sizes and configurations on the fuel consumption of the heating devices. Ventilation of family-type shelters by the induced draft method is effective and reliable if the following conditions are observed: a) Wind velocities around the stack outlet are kept to a minimum or a good ventilator stack cap is used; b) Filters are not used at the shelter inlet (air taken from body of house); c) The intake area of shelter is much larger than the cross-sectional area of the stack.

R 11

27,996

Weaver, J.A. EQUATIONS OF MOTION IN CIRCULAR MOTION TERMS FOR THE LIMACON. BuMed. Subtask MR005.13 6002.5, NADC ML 6507, Rep. 3, June 1965, 33pp. USN Aviation Medical Acceleration Lab., NADC, Johnsville, Penn. (AD 623486)

Equations of motion for the limaçon curve are developed for use in the study of vestibular function as related to vehicular motion. The equations are transformed from polar coordinate terms given in terms of the radius vector and the polar angle to circular motion terms given in terms of the radius of curvature and the central angle of the circle of curvature. This permits comparison of vestibular function studies done in vehicles with those done on human centrifuges.

R 3



27,997

Stephens, M.W. & Michels, K.M. MOTIVATIONAL CORRELATES OF INDIVIDUAL DIFFERENCES IN PERFORMANCE. FINAL REPORT MAY 1961-JANUARY 1965. Contract AF 33(616) 7962, Proj. 7183, Task 718305, AMRL TR 65 39, May 1965, 141pp. USAF Behavioral Sciences Lab., Wright-Patterson AFB, Ohio. (Purdue University, Lafayette, Ind.). (AD 618895)

A 3-year program of research was directed at the development of "paper and pencil" measurement techniques that would permit the assessment of the potential "motivability" of Ss in experiments concerning the effects of environmental stress on human performance. A largely empirical approach was used in this research. Performance measures of a large number of Ss on several different tasks were used as the criterion measures in item analyses of several personality inventory tests. The resultant pool of cross-validated items will, it is hoped, represent a step toward increasing the precision of performance research.

R 42

27,998

Propst, A.S. A PRELIMINARY STUDY OF MAN IN THE SEA DIVER PERSONNEL AND TRAINING IMPLICATIONS. Rep. WRM 66 5, July 1965, 24pp. USN New Developments Research Dept., Bureau of Naval Personnel, Washington, D.C. (AD 621527)

This research memorandum discusses projected diver requirements in the Navy and includes a review of existing and anticipated skills and knowledges, depth qualifications, equipment knowledge required, personnel selection pre-requisites, hazardous duty implications, NEC and diving pay considerations, types of underwater tasks performed, and new technical skills required. Comparison of existing, vs projected diver personnel and training requirements are discussed and reviewed in light of requirements envisioned for an on-going man-in-the-sea effort within the Navy.

R 14

27,999

Morton, W.W., Peckham, C.G. & Braun, J.F., Jr. FLIGHT TECHNICAL ERROR OF GENERAL AVIATION AIRCRAFT. FINAL REPORT. Contract FA WA 4542, Proj. 320 205 OIR, Rep. RD 65 60, June 1965, 37pp. US Systems Research & Development Service, FAA, Atlantic, N.J. (Technology Incorporated, Dayton, Ohio). (AD 622866)

This report presents a study of the Flight Technical Error (random deviations from intended cruise altitude) of 6 general aviation aircraft. Based in Ohio, Indiana, and New Jersey, these aircraft were a Beech C-45, a Bonanza H-35, an Apache PA-23-160, a Navion Rangenmaster, a Cessna Skylane, and a Comanche PA-24-180. A total of 626 hours of cruise data was collected. A statistical analysis of the results is presented.

28,000

Brodsky, N. (Chm.). LOGISTICS RESEARCH CONFERENCE. VOLUME 11-5. May 1965, 208pp. Airlie Conference Center, Warrenton, Va.

Papers on the following topics are included in this volume: maintainability prediction and design, establishment of maintenance doctrine, supporting requirements (parts, etc), workload measurement scheduling, and management and information systems. (HEIAS)

R scattered

28,001

Leiman, J.M. MAN-JOB MATCHING AND PERSONNEL INFORMATION MANAGEMENT. Report from: "NATO Conference on Operational and Personnel Research in the Management of Manpower Systems, Brussels, Belgium, 16-20 August 1965." Rep. SP 2160, Aug. 1965, 15pp. System Development Corporation, Santa Monica, Calif. (AD 622004)

This paper provides: a description of a model for the man-job matching process; a discussion of the various constraints and assumptions necessary to make the model applicable to typical operational conditions; and a discussion of the state-of-the-art in the prediction of job performance in new assignments. "Hard" variables are defined as personal characteristics which are related to measurements of a man's current skills and knowledge--these have been found to account for about half the variance in job performance in new assignments. "Soft" variables are defined as personal characteristics related to a man's motivation or the manner in which he applies his skills and knowledge in new situations--these have been found to have only marginal utility in the prediction of performance in new assignments. The paper then describes a procedure for developing job performance indices which are required inputs to the man-job matching model described earlier.

28,002

Kritzberg, S.F. CONCEPTUAL SYSTEMS AND BEHAVIOR STYLES. (Ph.D. Dissertation). Contract Nonr 1147(07), Tech. Rep. 13, Aug. 1965, 172pp. USN Group Psychology Branch, ONR, Washington, D.C. (University of Colorado, Boulder, Colo.). (AD 621974)

In line with the general assumption of Harvey, et al. that differences in conceptual make-up would result in differential response to confirmation and refutation and to the higher status source of perceived support or contradiction, it was found that: Under refutation, a) Authority-oriented persons (System 1) demonstrated evasive directiveness, socially-permissible dependence, passive resistance, and strong acceptance of assigned higher status; b) Individuals with anti-authority and negativistic dispositions (System 2) were competitive, aggressively challenging, and critical, and also were less inclined than others to give unequivocal agreement; c) Peer and friendship-centered Ss (System 3) evidenced a suppression of personal confidences; and d) Persons oriented toward information-seeking and exploratory behavior (System 4) gave relatively many interpretive and clarifying responses. Under confirmation, a) System 1 persons expressed the least passive resistance, less directiveness than during refutation, and a relatively high degree of deference behavior; b) System 2 individuals responded with boasting behavior; c) System 3 representatives showed a relatively high degree of deference behavior, gave a good deal of praise, and offered significantly more personal confidences than they did during refutation; and d) System 4 Ss exhibited a pattern of behavior similar to the style employed in refutation.

R 34

28,003

Holmstrom, E.J. INFORMATION OR NOISE? AN INVESTIGATION OF RESPONSE ERRORS. Contract ONR 1181(11), Proj. NR 177 470, Tech. Rep. 18, Sept. 1965, 22pp. Duke University, Durham, N.C. (AD 622252)

Response Errors are categorized into 2 major groups: a) Respondent Errors, i.e., Deliberate and Reporting Errors; and b) Instrument Errors, i.e., Commitment, Item-order, and Item-tone Errors. A review of literature is undertaken, investigating different sources of Response Errors. It is shown that respondent behavior is generally a function of 3 major stimuli: item-content, social, and instrument.

R 46

28,005

Hackman, J.R. TESTS, QUESTIONNAIRES AND TASKS OF THE GROUP EFFECTIVENESS RESEARCH LABORATORY: 1951-1964. Contract NR 177 472, Nonr 1834(36), Proj. 2870, ARPA Order 454, Tech. Rep. 24, July 1965, 79pp. USN Group Psychology Branch, ONR, Washington, D.C. (Psychology Dept., University of Illinois, Urbana, Ill.). (AD 623312)

This report presents a collection of research instruments used by the Group Effectiveness Research Laboratory (GERL) of the University of Illinois Department of Psychology from 1951-1964. Its purpose is to provide a single source to which researchers may refer for a summary of the development and application of GERL research instruments. Included are descriptions of seventeen types of tests and questionnaires and 52 group tasks in over 40 GERL research studies.

R 65

28,006

Dill, W.R., Gaver, D.P. & Weber, W.L. MODELS AND MODELLING FOR MANPOWER PLANNING. Contract NONR 760(24), Proj. NR 047 048, MSR Rep. 51, Sept. 1965, 52pp. USN Logistics & Mathematical Statistics Branch, ONR, Washington, D.C. (Graduate School of Industrial Administration, Carnegie Institute of Technology, Pittsburgh, Penn.). (AD 623393)

This paper reviews some earlier quantitative work in personnel flow and manpower planning. It describes the necessity and uses for models, and the means for their development and manipulation. It proposes models for several idealized hierarchical situations, and deduces data requirements and implications. Simulation and new problems are both treated.

R 33

28,007

Crider, A., Shapiro, D. & Tursky, B. STUDIES ON THE REINFORCEMENT OF SPONTANEOUS ELECTRODERMAL ACTIVITY. Contract Nonr 1866(43), Projs. NR 170 518 & 142000, Task Nonr 1866(43), Tech. Rep. 13, May 1965, 27pp. USN Group Psychology Branch, ONR, Washington, D.C. (Harvard Medical School, Boston, Mass.). (AD 621973)

A series of studies designed to evaluate the effect of reinforcing the occurrence of spontaneous skin potential responses recorded from the palmar surface of the hands in human Ss is presented. Contingent reinforcement results in a heightened rate of response emission when evaluated against a non-contingent reinforcement control in a variety of experimental designs. An activating, as opposed to a neutral, instructional set increases the intersubject reliability of the phenomenon by promoting the occurrence of resting level spontaneous activity. The effect is independent of time trends in skin potential level, heart rate, respiration rate, and gross skeletal activity. Theoretical and research implications of operant autonomic conditioning are discussed.

R 22

28,008

Constantino, C.A., Faust, J.C. & Sammon, J.W., Jr. AN APPROACH TO AUTOMATED CONTEXTUAL CHARACTER RECOGNITION. Proj. 5581, Task 558104, RADC TR 65 350, Sept. 1965, 15pp. USAF Rome Air Development Center, Griffiss AFB, N.Y. (AD 623487)

The purpose of this report is to combine current knowledge and technology to set forth an approach for designing a machine capable of recognizing various styles of typed characters. This approach differs considerably from existing approaches in that it has the capability to make use of context to aid in recognition. This is accomplished by the tabulation of the probability that one particular letter follows another letter. Hence, when attempting to recognize a typed character, the machine has knowledge of the previous letters or letter that it recognized, and can make use of this information in identifying the typed character presently being processed.

R 5

28,009

Brodsky, N. (Chm.). LOGISTICS RESEARCH CONFERENCE, VOLUME II-6. ca. May 1965, 106pp. Air-  
lie Conference Center, Warrenton, Va. (AD 623230)

The following papers are presented: command information requirements, the sequencing of information, the nature and importance of classification research in logistics information systems, research in the management of information and data systems, an operational approach to logistics information systems, some information problems in government-industrial logistics.

R many

28,010

Brodsky, N. (Chm.). LOGISTICS RESEARCH CONFERENCE, VOLUME II-1. May 1965, 135pp. Air-  
lie Conference Center, Warrenton, Va. (AD 623382)

The 7 papers contained in this volume covered the following topics: logistics planning for readiness, the economics of logistics planning, long-range planning, emergency operations in underdeveloped regions, and army support planning. (HEIAS)

R Scattered

28,011  
Brodsky, N. (Chm.). LOGISTICS RESEARCH CONFERENCE. VOLUME OF ABSTRACTS. 1965, 112pp.  
Airlie Conference Center, Warrenton, Va. (AD 623234)

This volume contains abstracts of the individual papers prepared for presentation to the following panels: logistics planning elements; procurement practices; government/industry development and production; practical inventory theory; maintenance and repair concepts; logistics information systems; cost effectiveness models and evaluation; measurement of logistics performance effectiveness; logistics simulations. (HEIAS)

28,012  
Brodsky, N. (Chm.). LOGISTICS RESEARCH CONFERENCE. VOLUME II-9. May 1965, 159pp. Airlie Conference Center, Warrenton, Va.

These papers cover 3 main areas: application of computer simulations in logistics research and operations, problems in developing and using simulations in logistics research and operations, and techniques likely to increase the effective use of computer simulations. (HEIAS)  
R many

28,013  
Alexander, L.T. & Cooperband, A.S. A METHOD FOR SYSTEM TASK ANALYSIS USING STATISTICAL DECISION THEORY. Report from: "American Psychological Association Meetings, Chicago, Illinois, September 1965." Rep. SP 2168, Aug. 1965, 14pp. System Development Corporation, Santa Monica, Calif. (AD 621999)

For system tasks involving detection, a method is presented by which statistical decision theory may be used to derive limiting conditions for adequate operator performance from results obtained in an abstract laboratory task. The limiting conditions may then serve as a basis for making design decisions regarding functions allocation and for specifying operating rules and requirements. The method is illustrated with a collision-prediction task, where 2 visually displayed objects move on converging paths, in which previous research suggests that performance depends on the ability to detect a nonzero rate of change in the relative bearing between the 2 objects.

28,014  
Wright, D.E. & Spickett, R.L. TUTOR ESCAPE SYSTEM INVESTIGATION AND TESTING. CEPE Rep. 1773, Nov. 1965, 183pp. RCAF Central Experimental & Proving Establishment, Air Material Command, Ottawa, Canada. (AD 478194)

As the Tutor aircraft has a side-by-side seating arrangement, the RCAF Institute of Aviation Medicine took advantage of the program to study the effect of the rocket blast on the remaining occupant following ejection of the other. Further, evaluations were made of the personal safety equipment, the canopy jettison system, the through-the-canopy ejection capability, an aircraft crash position indication installation and of the resistance of the wind screen to bird strike. It was concluded that the 2 rocket catapults tested, the RPI 2124-18 and the TI 2400-14, were suitable for installation in the Tutor escape system. However, it was apparent that the seat adjustment mechanism required replacement by a mechanism that could prohibit seat movement relative to the rocket catapult. The canopy jettison system was found to be satisfactory and the through-the-canopy capability was improved by replacing the original canopy breaker with one of an improved design. In the course of the test program the escape system was improved by the inclusion of a reversed lap belt, a modification to the MA6 lap belt automatic housing, a seat separator strap and an inclined seat pack to prevent slump of the occupant during the ejection. Slump was further reduced by the introduction of a back filler block and a parachute support block.

R 8

28,015  
Shure, G.H. & Meeker, R.J. PROBING BEHIND THE HUMAN DECISION. Report from: "15th Military Operations Research Symposium, Norfolk, Virginia, April 27-29, 1965." Contract ARPA SD 286, Rep. SP 1698/001/00, July 1965, 11pp. System Development Corporation, Santa Monica, Calif. (AD 623794)

This paper describes a technique for the systematic collection of information about human decision making-information which has hitherto been untapped by existing data-recording and evaluation procedures and which holds promise of increasing the value of currently recorded action and decision data. The technique was developed initially to assist in the collection and interpretation of data in online computer studies of experimental game behavior. Sample findings from these studies and an analysis of decision process based on earlier studies are presented to demonstrate the potential feasibility and value of the proposed procedures for the evaluation of decision-making behavior in computer-based command and control systems.

R 4

28,016  
Peters, W.R. & Cole, R.E. TIME-BASE EXPANSION AS APPLIED TO VECTORCARDIOGRAPHY. Task 775501, SAM TR 65 87, Dec. 1965, 7pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (AD 477269)

A technic is described for displaying vectorcardiograms with greater precision and clarity than is possible with most methods in use. This is accomplished by using a magnetic recorder-reproducer for time-base expansion of recorded VCG data. With time expansion, recorded data appear to be lower in frequency and can be graphically displayed on an X-Y recorder. Illustrations showing the vectorcardiographic loops obtained are contrasted to a conventional recording technic.

R 2

28,017

Primiano, F.P., Jr. THE INVESTIGATION OF THE PARAMETERS OF HEAD INJURY RELATED TO ACCELERATION AND DECELERATION. PROGRESS REPORT NO. 1, 1 JUNE 1964-15 FEBRUARY 1965. Contract DA 49 193 MD 2610, 1965, 28pp. Techonology Incorporated, Dayton, Ohio. (AD 620512)

The purpose of this research was to investigate the effects of acceleration of the approximate center of mass of the head with respect to the body eliminating the effects of deformations of the head as produced by a direct blow. The development of a mechanical device with which the head would be accelerated is described. A limited series of pilot studies were run to determine the levels of acceleration which would produce the symptoms of concussion and provide detailed information upon which to base the experimental protocol. Squirrel monkeys were used as Ss in these pilot runs. Plans for conducting the official experiments are discussed.

28,018

Videbeck, R. & Bates, H. VERBAL CONDITIONING BY A SIMULATED EXPERIMENTER. Contract Nonr 2296(02), Tech. Rep. 16, April 1965, 14pp. USN Group Psychology Branch, ONR, Washington, D.C. (Syracuse University, Syracuse, N.Y. & University of Missouri, Columbia, Mo.). (AD 620160)

While verbal reinforcers generally have been effective, there is considerable variability in results. 2 sources of variability are directly treated here, namely, the characteristic of the E and the S's awareness of the reinforcer-response contingency. The present study sought to control for absolute consistency in E behavior and reaction to the S's verbal emissions. To attain this end, a computer was programmed to simulate the functions of the E. Not only were the instructions to the S and the experimental stimuli presented in a standardized manner, but invariance in the reinforcing operations was attained. The computer was programmed to recognize the preselected response class and reinforce it with the typed message "very good." 16 Ss were used. The results obtained are similar to those found in verbal conditioning studies employing human E's in that Ss who were aware of the correct contingency between the reinforcement and their own responses showed significant acquisition of the conditioned response class. An "Exam" condition is described which permits S to demonstrate his awareness of the reinforcement contingency and frees E from relying on S's verbal statement during the interview. Major differences between the present and prior studies are discussed.

R 12

28,019

McGrath, J.J., Osterhoff, W.E., Seltzer, M.L. & Borden, Gail J. GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: METHODOLOGICAL ADVANCEMENT. Contract Nonr 4218(00), Tech. Rep. 751 5, Oct. 1965, 45pp. Human Factors Research, Inc., Los Angeles, Calif. (AD 624616)

This report describes a revision in a cinema method of simulating low-altitude flight. Cockpit instruments used in dead reckoning were activated and synchronized with the motion picture scene. The throttle control was linked to the projector motor to provide the pilot with control of the simulated speed of the aircraft. An automated response system was devised to provide more accurate performance measurement, and the experimental procedure was revised to provide a more effective practice session prior to test sessions. A methodological study showed that the new experimental method improved geographic orientation in pilots during simulated flight.

R 3

28,020

Longo, A.A. & Mayo, G.D. COMPARISON OF CONVENTIONAL AND PROGRAMED INSTRUCTION IN TEACHING AVIONICS FUNDAMENTALS. Proj. PFO17030401, Tech. Bull. STB 66 16, Dec. 1965, 31pp. USN Personnel Research Activity, Bureau of Naval Personnel, San Diego, Calif. (AD 627162)

This study is one of a series of investigations involving a variety of course content and training conditions where programed instruction will be compared with conventional classroom instruction to provide information about the general utility of programed instruction. Here the performance of 200 trainees taking 26 hrs. of conventional instruction in electrical calculations, direct current circuits, and direct current meters is compared with the performance of 200 trainees taking 19 hours of programed instruction on the same content. Results indicate: a) The basic electronics students learned a relatively large block of programed material to about the same degree but in substantially less time than was required by conventional instruction; b) the constructed response examination, prepared for programed instruction purposes, exhibited satisfactory reliability; c) the conventional and programed instruction groups did not differ significantly with respect to variability in performance; d) the "90/90 performance level" of programed material decreased as a function of the amount of programed material tested at a given time.

R 2

28,021

Lieberman, P. ON THE ACOUSTIC BASIS OF THE PERCEPTION OF INTONATION BY LINGUISTS. Word, April 1965, 21(1), 40-54. (USAF Cambridge Research Labs., L.G. Hanscom Field, Bedford, Mass.). (Reprint) (AD 623926)

The experiment is directed at isolating some aspects of fundamental frequency that are relevant to the perception of intonation. It shows that the pitch levels and terminal symbols of the Trager-Smith system (the most used notation in the USA) often have no direct physical basis. The linguist infers their presence from his knowledge of the transcriptions that the Trager-Smith system usually uses for certain combinations of words. The same comments seem to apply to secondary and tertiary stresses. Moreover, the results of this experiment indicate that there is no basis for regarding the Trager-Smith pitch levels as the perceptual manifestations of either absolute or relative fundamental frequency ranges except for certain contours that recur quite frequently in normal discourse. However, these contours appear to be perceived as complete entities. When other intonation contours occur, the Trager-Smith notation becomes inconsistent and has no reasonable relationship to those attributes of the physical signal which it supposedly is transcribing. An independently motivated generative model shows that the intonation of a sentence can be predicted if one considers 3 sets of factors: a) the physiological constraints imposed by the human respiratory system; b) the emotional state of the speaker; and c) the ultimate recoverability of the Deep Phrase Marker that underlies the final phonological shape of the sentence. The generation of the intonation of an utterance is organized in part, in terms of certain synchronized patterns of the muscular activity of the larynx and the respiratory system.

R 22

28,022

Kent, P.R. VISUAL REQUIREMENT FAILURE BY CANDIDATES REPORTING FOR BASIC SUBMARINE TRAINING DURING 1964. BuMed. Proj. MR005.14 2001 3.05, Subtask 3, Memo. Rep. 65 3, Rep. 5, March 1965, 7pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 624781)

This study investigated the reasons why a significant number of the 1964 enlisted candidates for submarine duty were disqualified for ocular reasons at the time of their final physical examination administered upon reporting for submarine training. Visual drops for 1964 totalled 279. This number does not include 41 candidates who met the other visual criteria but failed the color vision test. A large percentage of these disqualifying visual deficiencies should have been discovered at the preliminary examination performed at the previous duty station. Information presented in this report could be the basis for administrative action designed to correct substandard procedures which permit visually non-qualified candidates to receive orders for basic submarine training.

R 2

28,023

Hoffman, J.M. EXPERIMENTAL DESIGN FOR MEASURING THE INTRA- AND INTER-GROUP CONSISTENCY OF HUMAN JUDGMENT OF RELEVANCE. (M.S. Thesis). Contract AF 33(608) 1063, Aug. 1965, 111pp. Georgia Institute of Technology, Atlanta, Ga. (AD 620342)

The suspected variability of humans in judging the relevance of documents is one of the current problems confronting the development and improvement of document information and retrieval systems. The purpose of this thesis was to design a method to investigate the variation, measured in terms of consistency, of relevance judgments between 2 groups of analysts and among the analysts within each group. To test the validity of the proposed design, a pilot experiment was conducted using 2 groups of analysts (subject experts and non-experts) and 2 question-document collections (machine retrieved and randomly selected). Analysts were instructed to mark each document relevant or not-relevant to the given question and to record the time required to make such relevance assessments. The data collected permitted, for the pilot experiment only, the following conclusions: a) the analysts within the groups could consistently agree on the relevance of documents to questions; b) the degree of consistency of the 2 groups did not differ significantly; c) the 2 groups did agree on the relevance of a particular document to a question; and d) the method of document selection had a serious effect only on the consistency of the group of nonexperts. The times required for the relevance judgments were in all cases lower for the expert group. Analysis of the inconsistency among the analysts by means of relevance profiles indicated the probable need for relevance classes other than those of relevant and not-relevant.

R 20

28,024

Golueke, C.G., Oswald, W.J. & Gee, H.K. A STUDY OF FUNDAMENTAL FACTORS PERTINENT TO MICRO-BIOLOGICAL WASTE CONVERSION IN CONTROL OF ISOLATED ENVIRONMENTS. EIGHTH QUARTERLY REPORT. Contract AF19(628) 2462, Proj. 8659, Task 865903, AFCRL 65 496, SERL Rep. 65 14, Rep. 2, March 1965, 52pp. USAF Cambridge Research Labs., L.G. Hanscom Field, Bedford, Mass. (Sanitary Engineering Research Lab., University of California, Berkeley, Calif.). (AD 627036)

The report describes experiments with an algatron system (i.e., one that involves the use of a mechanically rotated culture) and presents a design of a system to support 2 men. An average algae yield of 1500 mg/l/day was obtained at inner and outer light intensities of 225 and 270 ft-c, respectively, the maximum light intensities obtainable with the available light source. From 87 to 91% of incoming volatile solids were stabilized at detention periods from 0.25 to 1 day. No relation was noted between detention period and removal of P, Mg, Ca, and N. Low temperature distilled water yield was 1.83 ml/sq m/min (ambient relative humidity, 80%). Water losses from an algal culture and from a carbon black suspension were closely similar; and that from both, about 5% greater than from water alone. Design estimates based on the experimental conditions indicate that a maximum of 11 algatrons, each 18 in. in diameter and 4 ft long would be required per man for gas exchange, waste treatment, and water recovery (about 200 liters/day).

R 8

28,025

Eggleston, L.A., Johnston, R.K. & Pryor, A.J. A STUDY OF THE USAF SCHOOL OF AEROSPACE MEDICINE HUMAN CENTRIFUGE. PHASE I. FINAL REPORT. Contract BOA AF 41(609) 2715, SWRI Proj. 03 1787, Oct. 1965, 30pp. USAF School of Aerospace Medicine, Brooks AFB, Tex. (Structural Research Dept., Southwest Research Institute, San Antonio, Tex.). (AD 624546)

A study was made of the fire hazards peculiar to the equipment and operation of the USAF School of Aerospace Medicine Human Centrifuge at Brooks Air Force Base, San Antonio, Texas. This study was based on present Air Force Standards. No major hazards were found, however, recommendations are presented which provide more in-depth protection for the centrifuge as it now exists. The major recommendation is the installation of a fire-fog deluge system (with alarm) in the pump room and sub-pit where the storage of combustibles is necessary.

R 5

28,026

Dye, H.E., Bloomquist, C.E. & Wilmot, C.H. FLIGHT CONTROL DATA AND INFORMATION EXCHANGE PROGRAM: PART I. INVESTIGATION OF NEED AND FEASIBILITY. Contract AF33(615) 1818, Proj. 8219, Task Nr: 821904, AFFDL TR 65 120, Rep. PRC R 606, Nov. 1965, 59pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Planning Research Corporation, Los Angeles, Calif.). (AD 626923)

This document reports the results of an investigation of the need for a permanent flight control data and information exchange program. Direct mail questionnaires were used to solicit the opinions of flight control specialists. The results of the opinion survey are summarized. 3 major abstracting and announcement media were critically examined from the standpoint of identifying information relevant to flight control systems. A literature survey was also conducted to determine the current status of technical documentation and dissemination. A group of specialized information centers of interest to flight control specialists are described. Based upon the findings, the general structure and guidelines are presented for a specialized information center designed solely to satisfy the information needs of flight control specialists.

R 22

28,027

Clark, E.F. CAMP CENTURY EVOLUTION OF CONCEPT AND HISTORY OF DESIGN CONSTRUCTION AND PERFORMANCE. DA Proj. IV025 IV025001A130, CRREL Tech. Rep. 174, Oct. 1965, 66pp. USA Cold Regions Research & Engineering Lab., Hanover, N.H. (AD 477706)

This report tells the story of Camp Century, an effort to learn how to construct military facilities on the Greenland Ice Cap. It describes briefly the research done by several laboratories, scientists, and engineers in achieving this objective. It discusses the development of concepts, methods, and engineering techniques which made the construction of Camp Century possible. Engineering performance of the camp and its facilities is summarized, and some of the more important reports resulting from the effort are referenced. It is concluded that subsurface ice-cap camps are feasible and practicable, that nuclear power offers significant advantages in reducing the logistical burden of supporting isolated, remote military facilities, and that the wealth of data and experience obtained from the Camp Century project will be of inestimable value in the development of designs for future ice-cap camps.

R 31

28,028

Borkowski, E.P. MANNING AND TRAINING REQUIREMENTS FOR THE U.S. NAVY SPACE SURVEILLANCE SYSTEM FIELD STATIONS. Rep. ND 65 66, June 1965, 35pp. USN New Developments Research Dept., Bureau of Naval Personnel, Washington, D.C. (AD 626527)

The U.S. Navy Space Surveillance System (SPASUR) is designed to detect, identify, and determine the orbits of all satellites passing over the United States. The System is composed of a Headquarters, 3 transmitting, and 4 receiving stations. In normal operation, the transmitting stations project vertically a thin continuous-wave, stationary fan-shaped radio beam. Radio reflections from satellites and other objects in orbit are detected by the receiving stations which triangulate on the bodies' positions in space. All data from the receiving stations are transmitted directly to NAVSPASUR Headquarters, where the information is analyzed. Data that have been collected and analyzed are stored in memory units of the computers at NAVSPASUR Headquarters. Incoming data are compared with all other data that are stored in the computer memory. When new satellites are detected, the orbits are determined and the computer predicts future orbital information. Orbital information on all new satellites is transmitted to Headquarters, North American Air Defense Command.

28,029

Bass, B.M. SOCIAL BEHAVIOR AND THE ORIENTATION INVENTORY: A REVIEW. Contract NONR 624(14), Tech. Rep. 9, Nov. 1965, 87pp. University of Pittsburgh Graduate School of Business, Pittsburgh, Penn. (AD 623691)

This is a review of research between 1959 and 1965 relating Orientation Inventory (Ori) scores to various kinds of other self-reports and to performance in controlled experiments. Although many of the studies are based on small samples and Ori scores are relatively low in retest reliability, the overall patterns of results suggest the utility of assessing orientation as a way of increasing understanding of performance in a variety of social situations. In many such situations, the greatest source of variance may be the interaction of individual orientation and the nature of the task. What is punishing for the self-oriented, may be of no consequence to the interaction-oriented and be positively reinforcing to the task-oriented.

R 75

28,030

Wright, G.H. & Hambacher, W.O. PSYCHO-SOCIAL PROBLEMS OF SHELTER OCCUPANCY. Contract OCD OS 65 5, Proj. 1500, Task 1510, Rep. 751.11 F, July 1965, 207pp. HRB-Singer, Incorporated, State College, Penn. (AD 623464)

This project developed a psychological model of protective shelters and a methodology for identifying and describing the psychological stresses and supports existing during enselterment. The admission wards of selected psychiatric hospitals were used as an analogue to the shelter confinement with Ss rigorously selected to insure valid extrapolation of results to the projected shelter occupancy population. Emphasis was placed upon studying the psychological rather than the physical environment. The approach utilized a literature collation covering the clinical as well as the traditional stress research in order to define and describe the psychological processes occurring within the shelter. Selected projective techniques, a ward behavior rating form, and an in-house developed self-rating form provided data for ordering the psychological processes under investigation in terms of probability of occurrence and importance of resulting behavior. These data also provided a base for validating comparisons with data from existing occupancy studies. Efforts were expended to develop methods and techniques for use in future occupancy studies designed to close existing gaps in enselterment knowledge. A set of diagnostic tools was developed for use by the shelter manager. A 2-man game was constructed and pretested as a screening device for shelter manager use. A set of probable behaviors related to the results obtained from the above were provided as well as a set of remedial actions to be taken by the shelter manager.

R 113

28,031

Sass, Margo A. & Wilkinson, W.D. (Eds.). COMPUTER AUGMENTATION OF HUMAN REASONING. Report from "Symposium held at the Department of State, Washington, D.C., June 16-17, 1964." 1965, 235pp. Spartan Books, Inc., Washington, D.C. & Macmillan & Co., Ltd., London, England. (USN Information Systems Branch, ONR, Washington, D.C. & Bunker-Ramo Corporation, Canoga Park, Calif.).

The papers presented at a symposium on computers and human reasoning held in June 1964 are reproduced in full in this volume. Among the titles are: a) reasoning in game playing by machine; b) experimental heuristics as an approach in problem solving; c) toward a formal theory of problem solving; d) the TRW Two-station On-Line Scientific Computer; e) PLATO: a computer-controlled teaching system; f) browsing in an automated library through remote access. (HEIAS)

R Many

28,032

Machol, R.E. (Ed.). SYSTEM ENGINEERING HANDBOOK. 1965, 1054pp. McGraw-Hill Book Company, New York, N.Y. (Systems Engineering Dept., University of Illinois, Chicago, Ill.).

This handbook considers system engineering from various standpoints: the environments, the components, theory, and techniques. A final section provides useful mathematics for system engineering. (HEIAS)

R many

28,033

Graham, C.H. (Ed.). VISION AND VISUAL PERCEPTION. 1965, 637pp. John Wiley & Sons, Inc., New York, N.Y. (Psychology Dept., Columbia University, New York, N.Y.).

This is an integrated, systematic account of nearly the entire spectrum of topics involved in vision. It is a treatment of the psychological, physiological, and physical bases of vision--the characteristics of the stimulus, biological and physiological bases of vision, sensory and psychophysiological data, color vision and color blindness, color appearances and constancies, after-images, space, form perception, and movement. (HEIAS)

R Many

28,034

Gillies, J.A. (Ed.). A TEXTBOOK OF AVIATION PHYSIOLOGY. 1965, 1226pp. Pergamon Press, London, England.

This massive textbook contains sections on the following topics: the physical environment of flight; the general effects of reduced atmospheric pressure; oxygen deprivation at reduced barometric pressure; thermal stress and survival; accelerations; noise and vibration; visual factors in aviation; aircrew performance; aircraft accidents. (HEIAS)

R Many

28,035

Chapanis, A. MAN-MACHINE ENGINEERING. 1965, 134pp. Wadsworth Publishing Company, Inc., Belmont, Calif. (Johns Hopkins University, Baltimore, Md.).

This compact text provides an introduction to human factors Engineering. Man's role in man-machine systems is outlined. This is followed by chapters on the visual presentation of information, speech communication systems, and the design of controls. (HEIAS)

R 31

28,036

Society of Experimental Test Pilots. 1965 REPORT TO THE AEROSPACE PROFESSION. "Ninth Annual Symposium Proceedings, The Beverly Hilton, Beverly Hills, California, September 24 & 25, 1965." Tech.-Rev., 1965, Second Issue, 7(4), 229pp. Society of Experimental Test Pilots, Lancaster, Calif.

This volume contains the proceedings of the 9th annual meeting of the Society of Experimental Test Pilots. 2 of the sessions were reports of flight tests of various aircraft. A third session was concerned with spacecraft development. In the last session, the role of manned aircraft in tactical warfare was discussed. (HEIAS)

28,048

Pay, R. PHOTOS POINT TO MARS LANDING DIFFICULTY. Missiles & Rockets, July 1965, 17(4), 13-19.

Mariner IV's photographs and other scientific results are being refined and scrutinized on an urgent basis because of their importance to planning for the Voyager program. Initial occultation data suggest that landing a capsule on Mars will be more difficult than had been expected, because of the thin atmosphere. Estimated surface pressure is only 10-20 millibars. First pictures show a variety of surface features at all scales, which suggests that the location and topography of a landing site must be precisely known if scientific results from it are to be interpreted properly. Mass estimates and the absence of trapped radiation belts or a magnetic field indicate that Mars may be structurally more like the Moon than the Earth. These findings suggest that the Voyager mission will be more problematical than was anticipated, that presence of higher life forms is unlikely, and that interpretation of the Martian structure may best be carried out by first-hand examination.

28,049

Zylstra, D. (Assoc. Ed.). MISSILES AND ROCKETS! NINTH ANNUAL WORLD MISSILE/SPACE ENCYCLOPEDIA. Missiles & Rockets, July 1965, 17(4), 37-149.

This missile/space encyclopedia summarizes U.S. and foreign spacecraft, satellites, vehicles, engines, system contractors, satellites in orbit, missiles, and drones. Under each item relevant information is given. For example, under Apollo Command and Service Module information is listed for type, mission, status, prime contractor, guidance, telecommunications, configuration, environmental system, heat shield, auxiliary power, propulsion, booster, and remarks.

R many

28,050

David, Heather M. VOYAGER STERILIZATION SETS PRECEDENT. Missiles & Rockets, Aug. 1965, 17(6), 32-33.

The critical problem of sterilization of the Voyager spacecraft is putting pressure on NASA to come up with standards acceptable to biologists but feasible in terms of spacecraft engineering design. A sizeable effort is under way at various NASA centers to tie down all the facets of the problem--the Jet Propulsion Laboratory being concerned primarily with spacecraft and component design techniques, Goddard Space Flight Center with definition of the upper limits of the Earth's biosphere in order to determine the problems of contamination of the outward-bound spacecraft, and Headquarters with a variety of studies on biological aspects, including assay and control.

28,051

Taylor, H. GT-5 PROVES U.S. RENDEZVOUS ABILITY. Missiles & Rockets, Aug. 1965, 17(9), 16-17. (National Aeronautics & Space Administration, Cape Kennedy, Fla.).

In the world's longest manned spaceflight to date the GT-5 has proven that: a) the U.S. has developed the technology necessary to rendezvous and dock with an orbiting object in space; b) the oxygen-hydrogen fuel cell is a reliable and far more flexible power plant than U.S. space officials had expected; c) man can play an important military role in space, including surveillance of missile launches, the identification of ground-based targets and the photographing of objects in space and on the ground. The Gemini 5 flight is briefly described. Applications of knowledge obtained from this flight to the future GT-6 flight are discussed.

28,052

Missiles & Rockets. GROUND-STATION AUTOMATION IMMINENT. Missiles & Rockets, Aug. 1965, 17(9), 32-33.

Complete automation of telemetry ground stations may herald new developments in the man-machine interface in checkout stations for missiles. A group of 6 subsystems will be designed and developed by DEI to receive and demodulate all types of Saturn telemetry data. All operational functions will be controlled by one master computer. The subsystems provide for demodulation of FM/FM, FM/FM/FM, PAM, PDM, PCM and SSB/FM data for real-time Saturn tests, and the processing of several of these types of data for computer entry. Each subsystem is under control of the computer, while another subsystem provides computer-programmed simulation data for station checkout. A significant aspect of the system design, according to DEI, is that it can be used not only in static missile firings but also in reception of data from an adaptive airborne telemeter. Other applications of the computer-controlled station, and particularly of the receiver subsystem, are being investigated by other government agencies.

28,053

Beller, W.S. (Senior Ed.). SPECIAL REPORT: OCEANOLOGY. Missiles & Rockets, Sept. 1965, 17(9), 23-67.

This special report on oceanology includes the following articles: a) Emphasis Shifts from Pure Research to Applications; b) Hull Materials Hold Key to Deep Exploration; c) Reliability, Standardization Sought in Instruments; d) Funding Hike Spawns Surface Platform Development; e) Demand for Submersibles Outstrips Availability; f) Supporting Man Beneath the Sea is Complex Task; g) Principle U.S. Oceanographic Facilities Detailed.

28,067

Webster, J.C. & Klumpp, R.G. SPEECH INTERFERENCE ASPECTS OF NAVY NOISES. Proj. SF 013 11 01, Task 1357, NEL Prob. N3 4, NEL Rep. 1314, Sept. 1965, 49pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

Representative samples of ship, office, and shop noises were analyzed to determine simple methods for rating noise in shipboard spaces in relation to interference with speech communication. For simplicity in speech interference measurement, it is recommended that an average be taken of the octaves centered at 500, 1000, and 2000 cps.

R 17

28,068

Webster, J.C. & Klumpp, R.G. MEASUREMENT OF SHIP NOISES. Report from: "Speech Interference Aspects of Navy Noises." Proj. SF 013 11 01, Task 1357, NEL Prob. N3 4, NEL Rep. 1314, Sept. 1965, 8pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

Overall levels on 3 aircraft carriers, a missile cruiser, and 2 destroyers ranged from 70 dB to over 120 dB; median sound pressure levels for 5 different groups of measurements were 86, 93, 84, 90, and 80 dB. The A-weighting levels taken aboard 2 carriers and a cruiser measured from 54 to 116 dB with a median value of 76 dB. Merchant ship values ranged from 65 to 105 dB. Speech Interference Levels for 2 carriers and 1 destroyer measured from 55 dB to 100 dB with median values of 66, 80, and 73 dB. The noise level in Navy ships is high enough to produce speech interference problems. It should be noted that although noise is a problem in the Navy, not all ships or compartments can be classified as noisy. It appears that noise may be a lessened problem in some late model ships.

28,070

Webster, J.C. & Klumpp, R.G. PSYCHOPHYSICAL MEASUREMENTS OF EQUALLY SPEECH-INTERFERING NOISES. Report from: "Speech Interference Aspects of Navy Noises." Proj. SF 013 11 01, Task 1357, NEL Prob. N3 4, NEL Rep. 1314, Sept. 1965, 18pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

The masking experiments reported here make it possible to obtain psychophysical speech interference levels (SILs). The psychophysical SILs are good predictors, but not superior to physical SILs and much more difficult to determine. (HEIAS)

28,071

Webster, J.C. & Klumpp, R.G. A SPEECH INTERFERENCE NOISE RATING CONTOUR. Report from: "Speech Interference Aspects of Navy Noises." Proj. SF 013 11 01, Task 1357, NEL Prob. N3 4, NEL Rep. 1314, Sept. 1965, 16pp. USN Electronics Lab., Bureau of Ships, San Diego, Calif.

An attempt has been made to show the similarities between 3 ostensibly different methods of rating noises for speech interference. The 3 basic methods are: Sound Level Meter (SLM) readings using various frequency weighting networks; Noise Criteria Contours, where spectral peaks of noise become tangent to one of a family of rating curves; and average-level methods, the Articulation Index (AI) being the most sophisticated method and the Speech Interference Level (SIL) being the simplest to use. A Speech Interference (SI) curve has been evolved which, when used as a frequency weighting network in a SLM, or as a noise-rating curve, or as a curve-fitting method of arriving at an SIL, greatly reduces the spread of scores among the 3 measurement methods when rating the speech-interfering properties of certain 16 noises.

R 14



28,076

Denison, D.M. & Ledwith, F. COMPLEX REACTION TIMES AT A SIMULATED CABIN ALTITUDE OF 8,000 FEET. FPRC/1235, April 1965, 17pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England). (AD 806972)

8 Ss were tested on a task involving spatial transformations of information that was presented to them. Performance was compared under conditions equivalent to breathing air at ground level and at an altitude of 8000 ft. Reaction times were significantly slower at the 8000 ft altitude, during the early learning of the skill.

R 11

28,077

Denison, D.M. THE EFFECTS OF INVERSION UPON LUNG VOLUME AND VENTILATION. FPRC/Memo 222, Jan. 1965, 12pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England). (AD 800053)

Lung volumes and lung ventilation have been measured in the upright and in an inverted position by a combination of spirometry and a helium dilution technique. Consistent changes in lung volume were seen--comprising mean changes of a 14% decrease in total lung capacity and vital capacity, and a 6% increase in inspiratory capacity, a 24% decrease in functional residual capacity, a 38% decrease in expiratory reserve volume and a 12% fall in residual volume. Changes in lung ventilation were variable but showed a mean increase of 13% in respiratory rate, tidal volume, minute volume and calculated alveolar ventilation. The relevance of these findings to the problem of weightlessness is discussed. A method of calibrating the helium katharometer is described that is of more general applicability.

R 5

28,078

Glaister, D.H. A LOW WEIGHT SCINTILLATION COUNTER WITH FOCUSING COLLIMATOR FOR ACCELERATION STUDIES. FPRC/Memo 218, Jan. 1965, 12pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England). (AD 800003)

Redesign of a commercially available scintillation counter resulted in a saving in weight of 25 lbs, whilst the background count rate rose by only 0.5 cps. No collimator giving a sufficiently narrow angle of view for lung function studies was available commercially, so that a multi-channel focusing collimator was designed and cast in Wood's metal. The performance of this collimator was investigated and compared to that of simple cone and parallel tube types. When used with radioactive Xenon ( $^{135}\text{Xe}$ ) within a phantom lung, 87% of counts come from within a cylinder 2 in in diameter.

R 3

28,079

Spells, K.E. & Blunt, O.J. THE AIR VENTILATED SUIT: FURTHER EXPERIMENTS BY TWO DIFFERENT METHODS TO STUDY THE GAIN IN THERMAL INSULATION DUE TO AIR FLOW THROUGH THE MATERIAL. FPRC/1233, July 1965, 39pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England). (AD 800004)

Various arrangements of air-ventilated jacket, including assemblies lined with a cloth of low permeability, have been investigated. Instead of expressing the results as the simple ratio between the rates of heat loss found without and with air ventilation, the percentage decrease in the original (unventilated) rate of heat loss produced by ventilation is used as a more practical and realistic measure of the advantage due to the operation of the dynamic insulation effect. In the course of these experiments a new method of measuring rates of heat loss has been developed which depends on observation of the rate of supply of energy to the thermostatically controlled water bath protected by the air-ventilated jacket. The new method has been compared in its results with the former (heat flow disk) method using the same jacket assemblies, its present defects have been indicated and suggestions for its improvement made. Notwithstanding certain inaccuracies which persist as the result of the experimental difficulties, the existence of the dynamic insulation effect has been established beyond reasonable doubt.

R 4

28,080

Kerslake, D.McK. & Clifford, J.M. A COMPARISON OF THE PERFORMANCE OF FIVE AIR VENTILATED SUITS AS HEAT EXCHANGERS, MEASURED ON A HEATED MANIKIN. FPRC/1239, April 1965, 22pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England). (AD 800005)

The thermal performances of 5 types of air ventilated suit have been compared. Direct measurements were made of effectiveness as an exchanger of sensible heat, and of the skin temperature distribution produced with cool air supplies. Evaporative performance was inferred from these results and consideration of suit design. Distribution of air through perforated large tubes only, as in the Mark 3 and Type 3A suits, was found to be associated with a low effectiveness. The effectiveness of the Mark 2 and Type 4 suits was high, but the skin temperature distribution with cool air supplies so poor that this property would be valueless in practice. It does, however, indicate a high evaporative efficiency, and these suits were considered the best in the evaporative role. The Mark 3 suit gave a good skin temperature distribution with cool air supplies, but its evaporative performance was considered bad. The Type 5 suit, a laboratory experimental garment, was good in all respects, showing that the combination of high effectiveness, good temperature distribution with cool air supplies, and good evaporative performance is feasible. Attention is drawn to the possibility of making use of the overlying clothing to simplify the ventilating garment and improve the ventilating performance of the assembly.

R 3

28,081

Goorney, A.B. THE HUMAN FACTOR IN AIRCRAFT ACCIDENTS - INVESTIGATION OF BACKGROUND FACTORS OF PILOT ERROR ACCIDENTS. FPRC/Memo 224, May 1965, 30pp. Flying Personnel Research Committee, London, England. (RAF Hospital Wroughton, Neuropsychiatric Centre, England). (AD 481988)

Information obtained from the pilots involved in pilot error accidents during the period under investigation has been compared, where possible, with information obtained from controls drawn from pilots flying similar aircraft types who had not been involved in pilot error accidents during the same period. Although evidence presented is of a highly presumptive nature, statistically significant backing is hampered by the fortunately small numbers of accidents in the Royal Air Force and the vast selection of variables in each case which defies accurate control. Evidence is presented that the following factors featured prominently in the pilot error group and may have played significant parts in causing the accidents: a) Lack of flying experience--total, on type, current; b) Fatigue, particularly resulting from excessive time on duty prior to becoming airborne; c) Personal worries and emotional stress of a severe nature; d) Complacency in experienced aircrew when flying relatively simple machines; e) Relaxation of personal discipline during overseas tours.

R 3

28,083

Clifford, J.M. HEAD VENTILATION. FPRC/1237, April 1965, 28pp. Flying Personnel Research Committee, London, England. (RAF Institute of Aviation Medicine, Farnborough, Hants, England). (AD 806936)

This report contains: the experimental results obtained while wearing the air ventilated skull cap vs air ventilated loop for head ventilation in hot environments--the cap was found to be marginally more efficient; however, it was more uncomfortable and led to chilling of the back of the scalp under high mass flows of cold air; aircrew opinion on the performance of these devices--the combination is satisfactory pending incorporation of a ventilating system into the protective helmet; results of head ventilation under the protective helmet--air inlet temperatures should not be above 35° C and the air must be dry, barometric shut off valve is unreliable and noise is generated by the ventilation system; and recommendations for easing the discomfort of the hot head in the hot aircraft cabin, e.g., aircrew exposed to tropical conditions should be issued an air ventilation loop for insertion into that helmet, a field trial be conducted wearing the loop attached to the under helmet surface.

R 6

28,084

Libovitz, B.A., Neveril, R.B. & Behls, H.F. PREPRODUCTION PROTOTYPE PACKAGE VENTILATION KIT; SECOND STRUCTURAL AND HUMAN FACTORS TEST. FINAL REPORT. Contract SRI B 70925 (4949A 28) US, Proj. 1432A, GARD Rep. 1278 4.2, Aug. 1965, 89pp. General American Transportation Corporation, Niles, Ill. (AD 632963)

Structural, human factors, and motor tests report of a Civil Defense shelter ventilator fabricated according to Specification MIL-V-40645. Since the unit operated without failures the specification was issued 16 August 1965. Minor improvements to this specification are recommended.

R 9

28,085

Beil, Barbara L., Oshinsky, Naomi S. & Wolfson, J. FOOD ACCEPTANCE AND PREFERENCE RESEARCH. AN ANNOTATED BIBLIOGRAPHY. Tech. Rep. EPT 5, 1965, 58pp. USA Natick Labs., Pioneering Research Div., Natick, Mass. (AD 633045)

The 293 items cited in this bibliography represent recent (1950 to 1964) contributions to the rapidly growing fields of food acceptance and preference research and related areas. The reports are divided into 4 topic areas: sensory studies (taste and smell); food acceptance and preference; animal studies; government reports. (HEIAS)

R 293

28,086

Love, R.H. MODEL INVESTIGATION OF THE HATCH LOADS ACTING ON A MOTHER SUBMARINE DUE TO THE ATTACHMENT OF A RESCUE SUBMARINE. Contract Nonr 4768(00), Proj. NR 062 357, Tech. Rep. 511 3, Aug. 1965, 20pp. Hydronautics, Incorporated, Laurel, Md. (AD 630485)

Model tests were made to determine the forces and moments at the aft hatch of a modern submarine due to the attachment of a rescue submarine. The model of the rescue submarine has vertical and horizontal thruster ducts fore and aft, and an all-movable ring tail. These devices are to be used to control the rescue submarine, both at hovering speeds and underway. It was found that the loads on the hatch of the prototype submarine are quite large. These loads can be reduced by proper coordination of the all-movable ring tail with the controls of the mother submarine.

R 2

28,087

Perry, C.J.G. PSYCHIATRIC SELECTION OF CANDIDATES FOR SPACE MISSIONS. J. Amer. Medical Assoc., Nov. 1965, 194, 841-844. (USAF School of Aerospace Medicine, Brooks AFB, Tex.). (Reprint) (AD 630477)

Psychiatrists are being called on to provide consultations in situations of increasing variability and complexity from their traditional role. The wide scope of psychiatry as a medical specialty allows for the appropriateness of such requests. But divergence from the traditional role raises problems. In the situation of being asked to select candidates for a space mission the primary problem is in identifying the most healthy individual. 15 candidates for a space mission were evaluated by a team of 2 psychiatrists and a clinical psychologist. All of the candidates were found to be qualified as being free from psychopathology. Beyond this, a rank order of the candidates was developed, based on positive factors of suitability for the assignment. There are no ready-made guidelines, specific stress situations, or personality type qualifications on which to readily determine such a selection. The psychiatrist must approach such a task in a globally oriented manner, making the most of his talent for empathic understanding of the individual candidate's personality and motivations.

R 14

28,088

Herrick, R.M. PSYCHOPHYSICAL METHODOLOGY III. DEDUCTIONS FROM THE ASSUMPTION THAT A CUMULATIVE SYMMETRICAL DISTRIBUTION UNDERLIES THRESHOLD PHENOMENA. Proj. WepTask R360 FR 102/2021/R01 101 01 (50 5 02), NADC MR 6515, Dec. 1965, 12pp. USN Aerospace Medical Research Dept., NADC, Johnsville, Penn. (AD 630391)

The phi-gamma and quantal hypotheses are special cases of the hypothesis of a cumulative symmetrical distribution. Assuming any cumulative symmetrical distribution it follows that: a) a descending method of limits (DML) threshold distribution is a mirror image of an ascending method of limits (AML) threshold distribution; b) the DML M threshold  $M_D$ , is higher than the AML M threshold,  $M_A$ ; c)  $M_A + M_D = S_0 + S_n$ , where  $S_0$  and  $S_n$  are the stimuli associated with p values (probability of a "Yes" response) of .00 and 1.00, respectively; d) the median threshold of the method of constant stimuli is  $S_0 + S_n/2$ , as is the M threshold of the pooled AML and DML distribution.

R 3

28,089

Brandegee, Ada S. & Bend, E. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. SHELTER MANAGER'S GUIDE. IN-SHELTER GUIDANCE. VOLUME III. Contract OCD PS 64 57, OCD Work Unit 1533A, AIR D93B 6/65 RP(c), June 1965, 213pp. American Institutes for Research, Pittsburgh, Penn. (AD 629941)

This document is one in a series of 3 volumes designed to aid the shelter manager in meeting his responsibilities in peacetime and, should the need occur, under emergency conditions. What binds these documents into a unified package is a concept of shelter management. This concept holds that every shelter manager must prepare himself, through training, and must prepare his shelter facility, through planning, to meet any situation requiring the use of the shelter. In addition, the concept holds that the in-shelter performance of the manager will improve if he is provided with guidance materials to support his decision making, no matter how well trained he may be. The Guide is organized in the following way: Section I. Entry Phase, covering the first few hours in-shelter. Section II. Initial Organization and Operations Phase, covering the first day or two in-shelter. Section III. Routine Phase, consisting of additional or modified guidelines for the remainder of the shelter stay. Section IV. Temporary Emergence Phase, covering preparation for temporary exit. Section V. Contingencies, consisting of decisions and actions to be taken in the event of a shelter emergency.

28,090

Brandegee, Ada S. & Bend, E. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. SHELTER MANAGER'S GUIDE. (SUMMARY OF TECHNICAL REPORT). Contract OCD PS 64 57, OCD Work Unit 1533A, AIR D93B 6/65 TR(c 11), June 1965, 7pp. American Institutes for Research, Pittsburgh, Penn. (AD 630052)

The goal of this project was to prepare and test a Shelter Manager's Guide which could be used in-shelter by either trained or untrained shelter managers to organize and run the shelter. The approach to this objective is described under the following headings: a) Guidance Material; b) Information Classification and Analysis; c) Establishment of Guidance Priorities and; d) Development of Guidance Materials. These guidance materials are then evaluated and several recommendations pertaining to the organization of shelter management guidance, its format, and its placement in the shelter are made.

R 2

28,091

Brandegee, Ada S. & Bend, E. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. SHELTER MANAGER'S GUIDE. (A TECHNICAL REPORT). Contract OCD PS 64 57, OCD Work Unit 1533A, AIR D93B 6/65 TR (c 1), June 1965, 18pp. American Institutes for Research, Pittsburgh, Penn. (AD 629935)

The purpose of this project was to develop and evaluate in-shelter guidance materials which any fallout shelter manager, trained or untrained, could use as an operational management guide. An initial version of the Shelter Manager's Guide was used by both trained managers and emergent leaders in 24- and 48-hr. habitability studies conducted by the American Institutes for Research. After the Shelter Manager's Guide was revised, it was evaluated in an experimental comparison with other types of guidance materials. The final product is arranged by priority of management decisions and actions within 5 shelter phases: Entry, Initial Organization and Operations, Routine, Temporary Emergence, and Contingencies (emergencies). It provides the management decision and actions necessary to organize and operate a fallout shelter, and supplies the information which the manager needs to support these decisions and actions.

R 19

28,092

Smith, R.W. & Lasky, Mary A. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. PLANNING A GROUP SHELTER. A PLANNING GUIDE. VOLUME II. Contract OCD PS 64 57, OCD Work Unit 1542A, AIR D93C 6/65 RP, June 1965, 163pp. American Institutes for Research, Pittsburgh, Penn. (AD 629940)

This document is one in a series of 3 volumes designed to aid the shelter manager in meeting his responsibilities in peacetime and, should the need occur, under emergency conditions. Volume II in this set of documents is entitled Planning a Group Shelter. It deals with the peacetime responsibilities of the shelter manager which focus upon the achievement and maintenance of a state of operational readiness of a shelter facility. The planning guide discusses the principal factors that must be considered in planning and developing a group shelter. It also identifies methods for meeting the requirements associated with these factors, and presents specific information that would permit the shelter manager to select methods appropriate to his needs.

28,093

Smith, R.W. & Lasky, Mary A. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. PLANNING A GROUP SHELTER. (A TECHNICAL REPORT). Contract OCD PS 64 57, OCD Work Unit 1542A, AIR D93C 6/65 TR(1), June 1965, 28pp. American Institutes for Research, Pittsburgh, Penn.

The field-verification and revision of guidance materials for individual shelter planning was the purpose of this report. The existing planning guidance was modified to reflect changes in technology and the shelter planning philosophy, and a Sample Basic Shelter Plan was developed for inclusion in the guide. The sample consisted of 16 communities selected to review and apply the guidance. 4 plans were written during the application of the guidance. 3 of these plans adhered closely to the AIR guidance materials and the fourth plan dealt primarily with shelter procedures. The critical comments made by the reviewers indicated that there were no technical inaccuracies and that the technical background information in the guide overlapped with that provided in shelter management training. The findings in this study were reflected in a revision of the guide. The guide has greater emphasis on shelter management, a section dealing with planning for shelter security, and more information on closing the shelter. Minor revisions were made to reflect changes in technology and changes in the Federal program. Also, 2 sample plans have been included in the guide as appendices. A set of recommendations about shelter planning were developed and presented in a technical report.

R 5

28,094

Smith, R.W. & Lasky, Mary A. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. PLANNING A GROUP SHELTER. (SUMMARY OF TECHNICAL REPORT). Contract OCD PS 64 57, OCD Work Unit 1542A, June 1965, 5pp. American Institutes for Research, Pittsburgh, Penn. (AD 629927)

During the course of a previous project for the Office of Civil Defense, the American Institutes for Research developed a guidance document for individual shelter planning entitled "Planning Guides for Dual-Purpose Shelters." The purpose of this project was to conduct field verification of the planning guide and to revise the document as required. The results of this study indicate that using the planning guide results in comprehensive and feasible shelter plans. A number of recommendations regarding shelter planning were developed and presented. They are as follows: a) The need to prepare individual shelter plans should be given more emphasis by civil defense organizations; b) To make the most effective use of the available physical resources and personnel, plans should be tailored to a specific shelter; c) The need for, and definition of, shelter planning should be discussed in shelter management training courses because: (1) qualified shelter managers probably have the ability to prepare and implement a plan; (2) the development of a plan serves as an effective device for training shelter managers; (3) preparing a plan provides the shelter manager with a satisfying task to perform during his peacetime tenure.

R 2

28,095

Smith, R.W. & Jeffreys, F.B. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. THE SELECTION AND RECRUITMENT OF SHELTER MANAGERS. (A TECHNICAL REPORT). Contract OCD PS 64 57, OCD Work Unit 1533A, AIR D93B 6/65 TR(a 1), June 1965, 79pp. American Institutes for Research, Pittsburgh, Penn. (AD 629914)

The development, field-verification, and revision of guidance materials for the selection and recruitment of shelter managers suitable for use by local civil defense personnel was the purpose of this project. The scope of existing guidance was reduced by eliminating both the training guidance and the discussion of the supporting methodology. A sample of 10 representative communities was selected to use the guidance to implement a selection and recruitment program. Data collected included: previous selection and recruitment efforts, comments on the materials, effectiveness of selection and recruitment programs implementing the guidance, and information on the community. Although response to the principles was favorable, considerable difficulty was encountered in convincing the local civil defense personnel to use personal contact in selection and recruitment. In those communities where the guidance was applied, the results indicated that the Guide's recommended methods are superior to the more traditional method of general requests for volunteers. Further verification of the guidance was gained from observing a pilot recruitment program conducted by region, state, and local civil defense workers in a western city.

R 45

28,096

Smith, R.W. & Jeffreys, F.B. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. THE SELECTION AND RECRUITMENT OF SHELTER MANAGERS. (SUMMARY OF TECHNICAL REPORT). Contract OCD PS 64 57, OCD Work Unit 1533A, AIR D93B 6/65 TR(a 11), June 1965, 5pp. American Institutes for Research, Pittsburgh, Penn. (AD 629915)

This paper is a summary of a technical report on the selection and recruitment of shelter managers. The application of principles expressed in the Technical Report required field tested guidance materials suitable for use by local civil defense personnel. The development, field-verification, and revision of such guidance materials was the purpose of this project. The findings in this study were reflected in a major revision of the Guide, now entitled, The Selection and Recruitment of Shelter Managers. (HEIAS)

R 2

28,097

Karlus, R., Merifield, P.M. & Rosencrantz, D.M. STEREOMAPPING OF UNDERWATER TERRAIN FROM A SUBMARINE. Ocean Sci. Ocean Engng., June 1965, 1167-1177. (Munich, Germany). (Reprint) (AD 630405)

Using deep-sea cameras mounted on a small 2-man submarine, a large section of a fourth century Roman shipwreck was successfully mapped using stereophotogrammetric techniques. The submarine "flew" over the wreck in a manner similar to that used in aerial survey techniques and took a series of photographs which were analyzed in conventional stereographic plotting instruments. The result was a planimetric map with object heights for an area of 6 by 12 m. Modified aerial cameras were used in pressure-proofed housings fitted with distortion correcting portholes. The submarine used was particularly well suited to the application because of its high stability and outstanding maneuverability at low speeds. Aerial film was used underwater because of its high contrast characteristics. The extension of the techniques to a synchronous 2-camera system is also discussed.

R 6

28,098

Thomson, K.F. & Houff, C.F. A SURVEY OF EUROPEAN TRAINING DEVICES. FINAL REPORT. Proj. 1902, Tech. Rep. NAVTRADEVEN IH 17, May 1965, 83pp. USN Training Device Center, Port Washington, N.Y. (AD 630246)

The United States Continental Army Command requirements dealing with the miniaturization of the battlefield (minimizing the amount of physical terrain required for Army training) have generated a number of research efforts. One of these efforts, covered by this report, was a survey of European training devices. The limited terrain available in Europe has imposed stringent real estate requirements for generations, and it was therefore thought fruitful to examine European solutions to the problems of military training in constricted geographical areas. This report encompasses the results of a survey of extant European training devices along with descriptions and estimates of the utility of these devices in application to problems of training the United States Army.

28,099

Weinwurm, G.F. & Zagorski, H.J. RESEARCH INTO THE MANAGEMENT OF COMPUTER PROGRAMMING: A TRANSITIONAL ANALYSIS OF COST ESTIMATION TECHNIQUES. Contract AF 19(628) 5166, Tech. Memo. 2712/000/00, ESD TR 65 575, Nov. 1965, 203pp. System Development Corporation, Santa Monica, Calif. (AD 631259)

The report embodies the latest results of a continuing research effort directed toward the development of management guidelines, standards, and techniques in the field of computer programming. The work is based upon earlier studies at System Development Corporation that included: the definition of variables affecting computer programming costs; the design of a questionnaire as an aid to collecting data on completed jobs; and the exploratory statistical analysis of 27 completed computer programming jobs to develop preliminary cost-estimation relationships. The present report is focused upon the statistical analysis of 74 completed computer programming jobs in terms of their resource-costs and related variables, e.g., man months, computer hours. The primary results developed in this analysis are: indices of job difficulty, job type, development environment, and job uniqueness; a "costliness" factor that permits programming tasks to be ranked in this respect; weighted composites of the indices for estimating the cost of particular programming jobs; and scoring and confidence-band techniques for blending intuitive managerial judgments with the formal cost-estimation procedures. Supplementary findings include indications of the relative sensitivity of job cost to changes in the values for the indices, and preliminary comparisons of resource usage between programs produced in machine-oriented or procedure-oriented languages. Also, recommendations are made for future research, including: the collection of more accurate and current data on programming jobs during the production cycle, and the development of a census of computer programming, to enable the design of precise sampling experiments for subsequent analyses.

R 22

28,100

Lakshmanan, T.K. & Munt, I. STUDY OF ELECTROLUMINESCENT DISPLAY TECHNIQUES AND EVALUATION OF A THIN FILM CROSS-GRID DISPLAY PANEL. FINAL REPORT AUGUST 1964-SEPTEMBER 1965. Contract AF 33(615) 1876, Proj. 6114, Task 611410, AMRL TR 65 166, Dec. 1965, 43pp. USAF Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. (Weston Instruments, Incorporated, Newark, N.J.). (AD 631465)

A study was conducted of the state-of-the-art of electroluminescent display techniques applicable to simulation of on-board displays of future vehicles and displaying computer and/or video information for use in training devices. An evaluation was made of the various fabrication techniques to determine the one with greatest potential for producing a high resolution, bright cross-grid type panel display. A thin film cross-grid panel, 9" x 9" with 258 x 258 lines was fabricated and evaluated to determine operational characteristics and limitations. Some basic considerations were given to driving electronics to determine designs for maximum flexibility for computer generated inputs.

R 28

28,101

Rothausser, E.H. (Princ. Investigator) & Urbanek, G.E. SPEECH QUALITY MEASUREMENTS. ANNUAL SUMMARY SCIENTIFIC REPORT. Contract 61 (052) 856, AFRL 66 170, Dec. 1965, 148pp. Institut für Niederfrequenztechnik, Vienna, Austria. (AD 633309)

This paper is concerned with studies about the modified isopreference method for rating speech communication systems in view of speech quality. The concept of speech quality is studied by subjective measurements in terms of intelligibility and "preference". Listening experiments using the forced pair comparison technique have been performed with trained and untrained groups of listeners. Various kinds of speech signals from different systems have been compared with 3 idealized reference signals using noise in additive and multiplicative form as degradation signals. Different kinds of tests for preference, intelligibility, rank ordering and loudness are reported which were utilized to study several aspects of speech quality.

R 8

28,102

Alfandre, H.J. AEROTITIS MEDIA IN SUBMARINE RECRUITS. BuMed. Proj. MR005.14 3100 1, SMC Rep. 450, May 1965, 18pp. USN Submarine Medical Center, New London Submarine Base, Groton, Conn. (AD 633931)

In order to evaluate the predisposing factors, the results, and possible sequelae of aerotitis media as encountered among submarine recruits during their physical qualification for submarine training, 432 such candidates were studied as they underwent pressurization in a dry-cylinder tank. Among these men, 156, or 36.2%, developed aerotitis following pressurization. Upper-respiratory infection was shown to predispose a man to development of aerotitis; also predisposing were the inability to insufflate the middle ear, and the presence of nasal allergies. The presence of adenoidal tissue and/or dental malocclusion did not appear directly related. Recommendations are made concerning the medical handling of pressurized groups, and methods of reducing the effects of the noise that accompanies the pressurization process.

R 37

28,103

Bend, E. & Collins, R.A. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. INTRODUCTION TO SHELTER MANAGEMENT. (A TECHNICAL REPORT). Contract OCD PS 64 57, OCD Work Unit 1533A, AIR D93B 6/65 TR(b 1), June 1965, 10pp. American Institutes for Research, Pittsburgh, Penn. (AD 630015)

The product of the research described in this technical report was a training text entitled Introduction to Shelter Management. The text was designed for use in end-product shelter management training. The technical report also briefly describes several different approaches to shelter management training into which the training text can be fit. The recommended approach was to use the text as background reading, and to use class meetings for discussions of specific problems and guidance pertinent to the particular group of shelter manager trainees attending the course. The content and organization of the textbook are briefly described in the report, and suggestions are offered for further research in the field of shelter management training.

R 4

28,104

Bend, E. & Collins, R.A. INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. INTRODUCTION TO SHELTER MANAGEMENT. (SUMMARY OF TECHNICAL REPORT). Contract OCD PS 64 57, OCD Work Unit 1533A, AIR D93B 6/65 TR(b 1), June 1965, 5pp. American Institutes for Research, Pittsburgh, Penn. (AD 630016)

The 2-fold goal of this project was to prepare a standardized shelter management textbook and to develop an approach to shelter management training that would permit the text to serve the widest possible range of training situations. A number of individuals associated with the training of shelter managers have attested to the need of a standardized introduction to shelter management. It was felt that the development of a text would be a step towards the goal of standardized shelter management training. Recommendations for further work in the development of shelter management training materials are as follows: a) Actual use-testing of the material developed (the text and its supplement) in a real classroom setting is needed for an accurate evaluation of the products; b) Additional research is needed to identify the special problems associated with large-shelter systems, and to incorporate these findings into training materials for large shelters; c) To maximize the training value of occupancy exercises, research should be directed toward the simulation of large-shelter problems by use of specially prepared scenarios or other techniques.

28,105

Gaul, J.W. APPLICATION OF PILOT-CONTROLLER INTEGRATION TECHNIQUES TO A REPRESENTATIVE V/STOL AIRCRAFT. FINAL REPORT. Contract AF33(615) 1866, Proj. 8219, Task 821904, AFFDL TR 65 200, Rep. 2226 903001, Sept. 1965, 156pp. USAF Flight Dynamics Lab., Wright-Patterson AFB, Ohio. (Bell Aerosystems Company, Buffalo, N.Y.). (AD 633269)

This report presents final results of a study of the application of Pilot-Controller integration design techniques to the flight control system of a representative V/STOL aircraft. Under this program the validity of the concept was established in the application to the X-22A V/STOL. In this application the PCI technique indicated the areas of the X-22A flight control system where modifications would result in the greatest improvement to the probability of mission accomplishment. Design modifications were made and an iteration using the technique was accomplished and the payoff was evaluated. The digital program which was developed and applied to the X-22A has general applicability to other aircraft. Several improvements to this program as well as to the details of technique application are suggested.

R 22

28,106

Hood, P.D., Kern, R.P. & Showel, M. RESEARCH ON THE TRAINING OF NONCOMMISSIONED OFFICERS: A SUMMARY REPORT OF PILOT STUDIES. Contract DA 44 188 ARO 2, DA Proj. 2J024701A712 01, Task NCO, Subtask 11, Tech. Rep. 65 17, Dec. 1965, 42pp. Human Resources Research Office, George Washington University, Alexandria, Va. (AD 631208)

As part of a continuing research effort on junior NCO leadership preparation training for advanced basic trainees, exploratory studies were conducted on: a) problems of selection and assessment of potential leaders among new recruits; b) feasibility of course compression within the Light Weapons Infantryman MOS training to permit introduction of leadership preparation material; c) development of an orientation program and motivational techniques for prospective leadership candidates; d) definition of leadership skills fundamental to job performance at the junior NCO level and appropriate for training at the AIT level; and e) exploration of methods for introducing junior NCO preparation within the Advanced Individual Training program. The studies yielded preliminary information relative to junior NCO leadership training on aptitude and sociometric ratings as promising selection factors, possible improvements in training methods, the need for development of criteria to assess technical proficiency and leadership skills, and the relation between training environment and effective leadership performance.

R 17

28,107

Carne, E.B. ARTIFICIAL INTELLIGENCE TECHNIQUES. 1965, 149pp. Spartan Division (Books, Inc.), Washington, D.C. & Macmillan & Company, Ltd., London England. (Greenville, Tex.).

This book is a guide to electronic techniques which can be used to simulate intelligence. It describes the central nervous system, discusses the major approaches to neuron modelling and describes the organization of a simple learning system. The second part of the book applies to the learning techniques to pattern recognition, discusses heuristic programming and presents methods for improving the reliability of logical systems.

R 145

28,108

Bailey, M. INVESTIGATION OF SHOE AND FOOT VOLUMES TO ESTABLISH A REDUCED SHOE SIZE TARIFF. Proj. T F015 14, RENS Rep. 14 04 002 00 1, July 1965, 19pp. USN Supply Research & Development Facility, Bureau of Supplies & Accounts, Bayonne, N.J. (AD 631294)

A series of measurements were made to learn the volume increments between shoe sizes, and to determine whether the volumes of feet and footwear are significantly changed after wear. The changes in foot volumes were determined by measuring the amount of water each 5's foot displaced before and after it supported his total weight for 5 min. The variations in shoe volumes were determined by measuring the quantity of Ottawa sand contained by the shoe cavity initially and after a prolonged period of wear. The increases in foot and shoe volumes averaged more than 5 & 10% respectively. The work showed how it is possible to reduce the number of shoe sizes of the prevailing Military tariff from 113 to fewer than 50 sizes, without diminishing the selectivity or variety of shoe fits normally available to Navy personnel.

R 9

28,109

Chomsky, N. & Halle, M. SOME CONTROVERSIAL QUESTIONS IN PHONOLOGICAL THEORY. J. Linguistics, Oct. 1965, 1(2), 97-214. (Massachusetts Institute of Technology, Cambridge, Mass.). (Reprint) (AD 630493)

Controversial theoretical points which have arisen from studies concerned with phonological component of a generative grammar are discussed in this paper. A generative grammar contains a system of rules that assign structural descriptions to the sentences of a particular language. The phonological component relates the phonetic representation of an utterance to its syntactic structure. The author replies to criticisms in 7 areas: a) the goals of linguistic theory; b) evaluation procedures; c) independence of phonology; d) the status of phonemes vs. features; e) the adequacy of Jacobson's theory with respect to natural classes; f) the validity of taxonomic linguistics; and g) the phonetic basis of phonemic analysis.

(HEIAS)

R 27

28,110

Emlet, H.E., Jr. METHODOLOGICAL APPROACH TO PLANNING AND PROGRAMING AIR FORCE OPERATIONAL REQUIREMENTS, RESEARCH, AND DEVELOPMENT (MAPORD). Contract AF 49(638) 1259, ANSER Rep. AR 65 4, Oct. 1965, 96pp. Analytic Services Incorporated, Falls Church, Va. (AD 479811)

The methodological approach to planning and programing Air Force operational requirements, research, and development (MAPORD) is a technique for identifying, according to the best available judgments, the elements and relations which are the basis for decisions in planning and programing Air Force operational requirements, research, and development. The technique employs a series of interlocking matrices which provide high visibility of the pattern of elements and relations, flexibility in modifying the pattern in response to changing events, changing emphases, and experimentation on the effects of altering judgments; and as rigorous a means as possible of relating judgments to each other and to a balanced program. The method is designed for application to electronic computers to afford high-speed updating, revision, interrogation, printout, and performance of all routine identifications of relations in the creation and maintenance of the MAPORD pattern. The method at its present stage of development incorporates a rigorous means for identifying certain broad categories of importance and is designed to accommodate techniques for further sorting of relative importance if and when such techniques can be defined.

R 5

28,111

Burton, D.R. THE THERMAL ASSESSMENT OF PERSONAL CONDITIONING GARMENTS. UDC 614.89:621 71, Tech. Rep. 65263, Nov. 1965, 40pp. Royal Aircraft Establishment, Farnborough, Hants, England. (AD 479416)

This paper presents a discussion of the thermal behaviour of personal conditioning garments both in theory and practice. A general equation, which is developed for the case of the convective air ventilated suit supplied with cool air, is modified for the cases of the water conditioned suit, and the air ventilated suit with warm dry air supplies. Results of past experiments at the Institute of Aviation Medicine and the Royal Aircraft Establishment are reviewed with the aid of this theoretical approach. It is concluded that there is a need for more systematic experimental data on personal conditioning, especially on convective air cooling. The broad outline of a possible experimental programme is discussed, including certain aspects which require new techniques to be developed. The potential performance of convective, evaporative, and liquid conditioning is predicted; but in view of the scarcity of useful data the results, which are presented in graphical form, are considered to be very tentative.

R 6

28,112

Geldard, F.A. COMMUNICATION PROCESSES. "Proceedings of a Symposium, Washington, D.C., 1963." NATO Conference Series - Volume 4, 1965, 299pp. Pergamon Press, Oxford, England. (Princeton University, Princeton, N.J.).

This volume covers the proceedings of a symposium on communication processes held in Washington in 1963. The various sessions covered the following topics: data presentation, language barriers and language training, group communication, and man-computer communication. A final chapter summarizes the proceedings. (HEIAS)

R Many

28,113

van de Geer, J.P. DATA PRESENTATION. Report from: "Communication Processes, Proceedings of a Symposium, Washington, D.C., 1963." 1965, 21-43. Pergamon Press, Oxford, England. (Perceptual Research Unit, Soesterberg, The Netherlands).

This discussion of data presentation is centered on general aspects of human information processing tasks. The first question considered is the quantification of human capacity, i.e., channel capacity. Next, the process of coding or categorizing multidimensional stimuli is described relative to channel capacity. Multidimensional stimuli are then discussed: the non-redundant dimension of variation, redundant variation, and irrelevant variation. It is suggested that though communication theory has been of great value for psychologists in the area of human information processing, the use of information concepts in terms of human channel capacity may now need amendment or replacement since "the human operator is not a channel in the strict sense of communication theory." (HEIAS)

R 114

28,114

Broadbent, D.E. SIGNAL TRANSMISSION: FACTORS WITHIN THE HUMAN OPERATOR IN COMMUNICATION. Report from: "Communication Processes. Proceedings of a Symposium, Washington, D.C., 1963." 1965, 63-74. Pergamon Press, Oxford, England. (Applied Research Unit, MRC, Cambridge, England).

The role of the human operator in communications is considered relative to 3 areas: speech perception, use of keyboards and continuous controls, and monitoring of some automatic process. Specific factors which affect performance in each area are discussed, e.g., word familiarity and frequency, type of keyboard, and signal probability. Advantages of each role also are indicated. (HEIAS)

R 26

28,115

Black, J.W. LANGUAGE BARRIERS AND LANGUAGE TRAINING. Report from: "Communication Processes. Proceedings of a Symposium, Washington, D.C., 1963." 1965, 101-128. Pergamon Press, Oxford, England. (Ohio State University, Columbus, Ohio).

The language barrier is related to pronunciation, vocabulary, and grammar, i.e., phonemes, morphemes and syntax. One study is reported in which this barrier was found to be partly attributable to aural reception (native students vs. foreign students). A second study demonstrated the role of foreign dialect in intelligibility; a third the improvement in intelligibility as a result of an hour of familiarization with the dialects. Another study examined the ability of various national groups in predicting successive spaces of phrases in their own language and in studied languages. Also the language barrier was investigated as a function of: intensity, S-N ratio, signal interruption rate, and low intensity obliteration of speech signals. Means of overcoming a language barrier are indicated, e.g., training, limited vocabularies, amalgamated languages. (HEIAS)

R 18

28,116

Miller, G.A. MAN-COMPUTER INTERACTION. Report from: "Communication Processes. Proceedings of a Symposium, Washington, D.C., 1963." 1965, 228-237. Pergamon Press, Oxford, England. (Harvard University, Cambridge, Mass.).

The problem of man-computer communication is discussed relative to the psycholinguistic principles involved. The mismatch in languages between binary computers and human beings and its solution by early workers in computer technology is reviewed. The further challenge of improving programming such that only minor modifications permit "talking" to the machine about a wide range of problems is considered. Several steps that have been taken toward this goal are described: coding, techniques for relative addressing, and hierarchical structuring of the program via subroutines and compilers. The 2 major classes of compilers--algebraic and list-processing languages--are briefly described. Their role in constructing languages much closer to natural language is discussed and future possibilities are considered. (HEIAS)

28,117

Newell, A. THE POSSIBILITY OF PLANNING LANGUAGES IN MAN-COMPUTER COMMUNICATION. Report from: "Communication Processes. Proceedings of a Symposium, Washington, D.C., 1963." 1965, 238-255. Pergamon Press, Oxford, England. (Carnegie Institute of Technology, Pittsburgh, Penn.).

This paper is concerned with the problem of understanding the nature of communication between man and computer when the human has only an idea of a solution; this is referred to as the planning language approach. 4 examples of human planning are examined in detail using the task, elementary symbolic logic. From these cases it appears that no separate planning language seems to exist. It is concluded that such communication between man and computer is possible as the computer moves in the direction of becoming more intelligent. The importance of psychological investigation in this problem area is emphasized. (HEIAS)

R 9

28,118

Licklider, J.C.R. PROBLEMS IN MAN-COMPUTER COMMUNICATIONS. Report from: "Communication Processes. Proceedings of a Symposium, Washington, D.C., 1963." 1965, 260-266. Pergamon Press, Oxford, England. (US Advanced Research Projects Agency, Washington, D.C.).

This paper discusses the problems in man-computer communication and possible solutions: a) the speed-cost mismatch as approached via small inexpensive computers and time sharing techniques; b) research on the physical interface between man and computer, e.g., CRT screen and light pen, keyboard devices; and c) the language system relative to the user's needs. (HEIAS)

28,119

Storey, T.G. & Dietrich, J.H. FIRE BIBLIOGRAPHY. SELECTED URBAN, AND MIXED URBAN - RURAL FIRES, 1940-1964. Contract OCD PS 64 229, May 1965, 46pp. US Department of Agriculture, Washington, D.C. (AD 634042)

This report provides an "annotated bibliography" of selected past fires that were considered for study by the staff of Project 229 and includes a brief summary and description of: a) strictly urban fires; and b) fires in mixed urban-rural areas. Study fires were chosen from this prepared list. 80 major fires occurring since 1940 are described. Of these 80 fires, 47 are urban fires and 33 are mixed urban-rural fires. The listing of fires in this manner provides a base from which to choose additional fires for possible study, and makes available the results of our search of past fires for people who in the future might review or study large fires. Criteria for selection were as follows: a) Had occurred in the United States in 1940 or later; b) Were strictly urban fires, or rural fires that involved a substantial number of structures; c) Were fires that showed tendencies to spread--particularly in mixed urban-rural areas; d) Involved mutual aid, preferably from several different agencies and organizations; e) Presented suppression problems such as structure protection, long distance spotting, evacuation, over-extended forces, etc; f) Formal reports, office reports, or other written information were available.

R 80



28,121

Dyer, G.C. EFFECT OF AIRCRAFT SPEED ON LOW-ALTITUDE ACQUISITION OF GROUND TARGETS. PHASE III. FINAL REPORT, 28 SEPTEMBER 1964-4 JANUARY 1965. APGC Proj. 0501T1, APGC TR 65 73, Nov. 1965, 194pp. USAF Air Proving Ground Center, Eglin AFB, Fla. (AD 481113)

This report covers the third in a series of tests designed to gather basic quantitative data in the area of low-altitude, high-speed, target acquisition. Specifically, this test was conducted to determine the ability of pilots to visually acquire and identify ground targets over an extended speed range at different low altitudes. A study was also made of the ability of the pilots to maneuver and align their aircraft with the targets immediately after target acquisition.

28,122

Cofer, C.N. FINAL REPORT. (LEARNING, RETENTION AND RECOVERY OF MEANINGFUL MATERIALS). Contract Nonr 656(30), Proj. NR 154 161, Dec. 1965, 5pp. Psychology Dept., Pennsylvania State University, University Park, Penn. (AD 479524)

This project has been concerned, generally, with a variety of problems encountered in the study of verbal learning and verbal behavior. Several areas of investigation have been emphasized: a) Studies of Free Recall; b) Paired Associate (PA) Learning; c) Studies of Association; d) Short Term Memory; e) Recognition and Recall. The reader is referred to previous Technical reports for complete description of these studies.  
R 15

28,124

Havers, J.A., Monk, C.B., Jr. & Koeller, E.H. AN INVESTIGATION OF MINIMAL EQUIPMENT NEEDS IN PERSONNEL SHELTERS. FINAL REPORT. Contract OCD PS 64 50, IITRI Proj. M6064(4), Work Unit 1216A, June 1965, 494pp. IIT Research Institute, Chicago, Ill. (AD 631424)

This final report describes an investigation which has been performed in connection with the Shelter Optimization Studies at the IIT Research Institute. Performance requirements for equipment items in fully-buried personnel shelters are first identified, insofar as the current knowledge will permit, and suitable equipment systems are then described. Emphasis is placed upon the austere shelter, wherein only those equipment needs which are deemed essential for survival are satisfied. Finally, for illustrative purposes, equipment systems are described for the 3 shelter sizes and for 4 identified climatic regions. Approximate estimates of equipment costs are included in the report.  
R 126

28,125

Bruce, D. & Cofer, C.N. AN EXAMINATION OF RECOGNITION AND FREE RECALL AS MEASURES OF ACQUISITION AND LONG-TERM RETENTION. (LEARNING, RETENTION AND RECOVERY OF MEANINGFUL MATERIALS). Contract Nonr 656(30), Proj. NR 154 161, Tech. Rep. 15, Dec. 1965, 16pp. Psychology Dept., Pennsylvania State University, University Park, Penn. (AD 479523)

While showing different degrees of sensitivity in the detection of learning, free recall and recognition measures nonetheless yielded acquisition curves of similar shape. Recognition retention functions were found to lie above or below and to have greater or lesser slope than comparable free recall retention curves, depending on conditions.  
R 12

28,126

Benesch, S.E. & Gates, C.R. MODEL OF FAILURE IN COMPONENTS. Contract DA 04 495 Ord 18, Rep. EP 26, ca. 1965, 13pp. Jet Propulsion Lab., California Institute of Technology, Pasadena, Calif. (AD 631495)

The theory of failure is fundamental in understanding the reliability of complex systems. This paper is a review of some aspects of the theory of failure of particular interest to statisticians. There are 2 approaches available in this theory: the phenomenological and the microscopic. Treated are models of failure leading to 3 frequency functions of failure: the normal, the logarithmic-normal, and the exponential. In each instance these 3 classes are treated from both the phenomenological and the microscopic aspect. In conclusion, a problem of particular interest to statisticians is presented which arises in failure theory.

28,127

Veazie, W.H., Jr., Heenan, W.F., Gilmour, B.A., Holt, J.C., et al. COMPREHENSIVE REVIEW OF THE LITERATURE, SUBPART B. FOOD SURVEY. FINAL REPORT. PART I. Contract DA 18 064 AMC 399(A), Oct. 1965, 168pp. Columbus Labs., Battelle Memorial Institute, Columbus, Ohio. (AD 483179)

The literature on foods consumed in various areas of the world was reviewed with respect to information on diets, methods of storage and preparation, and chemical composition. Psychological, sociological and cultural aspects of preparation and consumption practices in representative countries in the geographical areas covered by this survey were also reviewed. In addition, persons knowledgeable in the international aspects of food and nutrition were consulted for information relating to these subjects for inclusion in this report.  
R 9

28,128

Menne, D.F. & Rapp, J.R. TACTICAL TARGET ACQUISITION BY PATTERN RECOGNITION METHODS. DA Proj. 1L013001A91A, Memo. Rep. 1708, Nov. 1965, 22pp. USA Ballistic Research Labs., Aberdeen Proving Ground, Md. (AD 479963)

This report discusses tactical target acquisition problems of concern to the Army, especially in regard to the application of pattern recognition methods to automatic target acquisition systems. Perception and classification are 2 phases of the acquisition problem. Perception is the phase of the acquisition problem which describes targets and backgrounds in the form of signatures from which distinguishing features are extracted. Classification is the subsequent phase which forms a pattern vector with the features and separates the pattern vectors into subsets corresponding to classes of targets and backgrounds. Researchers in the field of pattern recognition are advancing the technology. However, specific aspects of the problem that are unique to the Army require investigation. These aspects are associated with signatures of targets and backgrounds, methods to enhance signatures, and features that serve to discriminate targets and backgrounds.

28,129

Shrauger, N.K. FIELD TESTS OF VHF MAN-PACK RADIOS. Contract DA 36 039 AMC 00040(E), ARPA Order 371, Spec. Tech. Rep. 8, April 1965, 45pp. USA Electronics Labs., Fort Monmouth, N.J. (Stanford Research Institute, Menlo Park, Calif.). (AD 480587)

This report describes the performance tests and their results conducted on selected VHF man-pack radio sets under controlled conditions over the delta region near Bangkok. The data led to the following conclusions: Received signal strengths generally varied with range in accordance with calculations. Increases in transmitter power gave significant increases in useful range. No significant difference was observed between day and night operation. Variations in range capability were found as frequency was changed. (No explanation is offered in this report since data regarding antenna pattern variation with frequency are not available, and this can be a significant factor.) For the sets tested, effective ranges during the dry season over flat, open, delta regions have been determined. At the range where received signals disappeared, a set elevation of about 10 ft was required to regain communications.

R 8

28,130

Shapiro, G.I. AN APPLICATION OF INTEGRAL GEOMETRY TO AUTOMATIC PATTERN RECOGNITION. Contract AF 33(615) 1267, Proj. 414408, Task 4144, Tech. Rep. RF 1801 15, Dec. 1965, 53pp. USAF Avionics Lab., Wright-Patterson AFB, Ohio. (Ohio State University Research Foundation, Columbus, Ohio). (AD 480169)

A method of pattern recognition utilizing integral geometry to make measurements on patterns is studied. The identification of a pattern depends on how approximate values of its 2 descriptors determined by this method compare with exact values. These approximate values appear to be reasonably accurate and independent of pattern size.

R 3

28,131

Weisz, J.D. MAXIMUM NOISE LEVEL FOR ARMY MATERIEL COMMAND EQUIPMENT. HEL Standard S 1 63B, June 1965, 11pp. USA Human Engineering Labs., Aberdeen Proving Ground, Md. (AD 632913)

This standard (HEL S-1-63B) establishes the maximum noise level permitted at personnel occupied spaces of equipment designed, developed or procured by AMC. This standard establishes the testing requirements for determining conformance to the maximum noise level permitted. This standard is not intended for application as an industrial standard. Its use shall be limited to military equipment. This standard is not to be considered as a hearing damage risk criterion.

28,132

Murrell, K.F.H. ERGONOMICS. 1965, 496pp. Chapman & Hall, London, England.

This book is the first comprehensive textbook in English for students of Ergonomics. The book has been carefully planned to make for easy reading, whether the student comes to Ergonomics from anatomy, physiology, psychology, or industrial and personnel administration. The subjects covered include data on the physical and mental capacities of operatives, the design of equipment, the physical environment, the measurement of work, work organization (work/rest schedules, the nature of 'fatigue', shift work, etc.), and the problems of ageing. The book contains a very full review of research contributions to the various aspects of the subject. The findings of research are discussed in a practical way, the emphasis throughout being on their relevance to industrial problems, so that managers and engineers will be able to profit from this book as much as students.

R many

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